MAN RISES TO PARNASSUS

By HENRY FAIRFIELD OSBORN

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Man Rises to Parnassus

Critical Epochs in the Prehistory of Man

BY

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TO
MY BROTHER
WILLIAM CHURCH OSBORN
in appreciation of his active share
as a Trustee in raising the
standards of Scholarship
and Research
in his
Alma Mater
PRINCETON UNIVERSITY

PROLOGUE

Ἵν' ὑπὸ δειράσι νιφοβόλοις Παρνασσοῦ κατενάσθη Φοίβου μέλαθρα.
Where 'neath the snow-beaten ridges of Parnassus were stablished the courts of Phoebus.—*Euripides.*[1]

IN the spirit of the rise to Parnassus we may direct our inquiry in these lectures especially toward evidence for the spiritual, intellectual and moral, rather than toward the physical, characters of the prehistoric races.

Hitherto our attention has been directed mainly to the anatomical characters of fossil man because these characters were the first to come to the surface. Indeed, human and comparative anatomy, throughout its long history, dating back to the Greeks, has never enjoyed a series of triumphs greater than the philosophic interpretation of fossilized remains which are too often fragmentary and incomplete. The anatomy of prehistoric man by these very triumphs has won a far larger share of attention than his higher characteristics. We shall in time be in a position to tell with great precision the whole story of the physical ascent of man—the story of his food, of his bodily habits and customs, of his modes of locomotion whether walking or climbing, of his ever increasing capacity for the use of tools, for the chasing of game and for physical and intellectual contests with his fellow-man. In studying all these anatomical attributes—for example, the form, weight, and psychic areas on the surface of the human brain—the point we shall chiefly

[1] Professor Edward D. Perry of Columbia University, to whom the author owes this citation, writes October 29, 1926: "The last two words do not actually occur in this position, but they are used just above in the choral ode and are to be understood as the subject of the verb κατενάσθη. Note that in texts of the time of Euripides the name of the mountain was written with only one σ."

stress is not these anatomical characters per se, *but their bearing on our knowledge of the development of the mind and spirit of man.*

In other words, the higher philosophical interpretations of crude anatomical and archaeological facts lead up to the higher central theme of these lectures, namely, how man rose to Parnassus.

In my previous lectures and writings since the year 1891 *on the absorbing subject of prehistoric man, especially in "Men of the Old Stone Age," I have from the first endeavored to redeem his reputation of being very close to the brutes and of possessing many qualities of character and of mind which we do not like to associate with any of our ancestors, however remote. I do not share the contempt with which many uninformed people regard the higher members of creation which, though they were not actually ancestral, bear many resemblances to ourselves. Prolonged and sympathetic observation reveals many noble traits of character in all the higher members of the mammalian kingdom, near to or remote from ourselves. Among all the social mammals and birds, especially, we observe comradeship, mutual helpfulness, maternal and paternal devotion to the young, the sharing of danger, and willingness to sacrifice life for offspring or for a comrade. Such moral traits, if observed in ourselves, would rank high among the most desirable elements of human character.*

Similar noble traits are also widely manifested among primitive human societies and especially among those who have had the least contact with western civilizations. These traits include the safeguarding of the family, protection and careful upbringing of the young, protection of the chastity of women, inculcation of absolute integrity both in word and deed, communal and tribal cooperation for the general welfare,

reverence for higher supernatural powers, love of decoration, of beauty and of art. Practically none of the primitive races exhibits all these fine traits; some of the primitive races exhibit none of them. In recent anthropology we may refer to several sympathetic observers of primitive peoples, such as Herbert Ward in Africa, William T. Hornaday, William Beebe in the Far East, and especially Robert Lowie, who has treated primitive society, morals, and religion in a masterly manner.

All human races, fossil or living, demand our sympathetic understanding, and we should endeavor to extend this appreciative understanding alike to the existing and to the prehistoric races of man. We need not deny to our Stone Age ancestors moral traits which we observe among primitive peoples today. By prolonged and intensive research we have discovered that the lower Stone Age men are the equals in brain power of some of the primitive existing peoples, and that some of the higher Stone Age men are actually superior to some of the higher existing races.

Thus we are venturing into the new and fascinating but little trodden field of the gradual rise of the higher powers of man. It is true that we cannot progress very far, but it will be admitted that our psychic theme transcends in interest even the greatest triumphs of human and comparative anatomy.

Henry Fairfield Osborn.

American Museum of Natural History
and
Columbia University
February 28–March 4, 1927.

Since this volume went to press there has appeared J. Reid Moir's volume, "The Antiquity of Man in East Anglia," in which especially the information regarding the Dawn Man of East Anglia is amplified and the discovery fully described by this original and most able observer. But J. Reid Moir and Sir E. Ray Lankester both differ widely from the present author in respect to the geologic antiquity of the Dawn Man of East Anglia and with respect to comparison of the flint culture of East Anglia and the Cromer Forest Bed with pre-Chellean and Chellean cultures of the River Somme in France (compare Fig. 2). Naturally, these correlations of flint and of geologic horizons are subject to further research, but the present author feels confident that the geologic table on page 24 (Fig. 1), is substantially correct.

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I

THE GREEKS FORESEE THE GRADUAL RISE OF MAN

O divine aether, and ye swift-winged breezes, and ye fountains of rivers, and countless dimpling of the waves of the deep, and thou earth, mother of all—and to the all-seeing orb of the Sun I appeal; look upon me, what treatment I, a god, am enduring at the hand of the gods! . . . For having bestowed boons upon mortals, I am enthralled unhappy in these hardships. And I am he that searched out the source of fire, by stealth borne off enclosed in a fennel-rod, which has shewn itself a teacher of every art to mortals, and a great resource.

—*Aeschylus: Prometheus Bound.*

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THE GREEKS FORESEE THE GRADUAL RISE OF MAN

The Olympic deities not helpful — The Greeks chiefly interested in the origin of man — The rise of Anatomy and of Physiology — Prometheus voices the spirit of discovery

O glory of the Greeks! who first didst chase
The mind's dread darkness with celestial day,
The worth illustrating of human life—
Thee, glad, I follow—with firm foot resolved
To tread the path imprinted by thy steps;
Not urged by competition, but, alone,
Studious thy toils to copy; for, in powers,
How can the swallow with the swan contend?
Or the young kid, all tremulous of limb,
Strive with the strength, the fleetness of the horse;
Thou, sire of science! with paternal truths
Thy sons enrichest: from thy peerless page,
Illustrious chief! as from the flowery field
Th' industrious bee culls honey, we alike
Cull many a golden precept—golden each—
And each most worthy everlasting life.
For as the doctrines of thy godlike mind
Prove into birth how nature first uprose,
All terrors vanish; the blue walls of heaven
Fly instant—and the boundless void throughout
Teems with created things.
—*Lucretius: De Rerum Natura, Book III.*

ALTHOUGH the Greeks conceived of Pallas Athene, the goddess of wisdom, as springing full-armed from the head of Zeus, there is in their writings no trace of any similar notion regarding the instantaneous creation of man as complete and fully equipped in body and mind. Moreover, they appear to be the first of all civilized peoples to

suggest a naturalistic origin of man and a series of very gradual steps upward in his industrial, social and intellectual life.

These are the slow steps in the ascent of Mount Parnassus, which during the long period of Greek thought finally became in their imagination the ideal abode of the Muses of arts and letters and the courts of Phoebus Apollo, as set forth in the language of Euripides.

The Olympic Deities Not Helpful

The gods of Olympus not only took no helpful part in the origin of man, in the way of physical or intellectual creation, but, according to the Greek poet Aeschylus (525–456 B.C.), frustrated all man's efforts to rise from his primitive helpless, ignorant, unscientific condition into a resourceful, observant, learned, scientific and civilized condition. Thus with gods who took no part in the origin of man and who rarely intervened in human affairs except to aid a hero, to punish an offender with a thunderbolt or a storm, or to become enamoured of a beautiful earthly maiden, the Greek natural philosophers and observers were driven to their wits' end to account for a natural origin of man, for man was ever their chief concern. Doubtless the subject was very much discussed and debated, but only a few fragments of current hypotheses and speculations have come down to us. All we know of the pioneers of the earliest period—of Thales (640–546 B.C.), of Anaximander (611–547 B.C.), and of others of the Ionian school—has been handed down by later commentators.

Surrounded by the sea, constantly observing the wealth of life exposed by rising and falling tides, the Greeks natu-

rally assumed at first that all life arose from the blue waters of the ocean. Were not the sea cows or Sirenians of the not far distant shores of Africa the mermaids of more recent fables? Were not the tales of sailors regarding the half-fish, half-human beings partly responsible for these 'mermaid', 'merman' speculations? Attributed to Anaximander is the notion that amphibious or semi-aquatic men first appeared in the form of fishes in the water and emerged from this mother element only after they had improved so far as to be able to develop further and support themselves upon land. In support of this statement Anaximander pointed to the long period of helplessness after birth as one of the proofs that man had advanced far beyond his original or primitive condition! It appeared possible that the original aquatic men had persisted through their trying metamorphoses long enough to produce true land men. Anaximander's volume, "Concerning Nature," περὶ φύσεως, written 2,500 years before our time, "was a variant of the old traditional cosmogonies. It told of how in the beginning the earth was without form and void. It sought to trace all things back to the Infinite, τὸ ἄπειρον, to That which knows no bounds of space or time but is before all worlds, and to whose bosom again all things, all worlds, return."[1] Although gifted with more inventive genius than love of observation, Anaximander was no more remote from fact in his fantastic speculations as to the origin of man than were several west European writers of the early part of the eighteenth century when they described the earth as first existing in a fluid state, which was followed by a period of gradual desiccation during which man appeared in advance of all other living creatures.

[1] D'Arcy Thompson: Natural Science. P. 137 of "The Legacy of Greece."

Anaximander's explanation of the metamorphosis of 'aquatic men' into 'land men' is the first dim adumbration of a belief in slow anatomical transformation rather than in the immediate attainment of anatomical perfection, as well as a suggestion of the deep significance of infantile characters as pointing back to ancestral history—a notion which has expanded into the so-called 'biogenetic law.' This principle of the recapitulation of the adaptations of our more or less remote ancestors, fully expanded by Louis Agassiz, Ernst Haeckel and others, teaches that many of the stages of body and mind and many of the characters of the body before birth give an abbreviated history of man's remotest and more immediate ancestry.

All of this intellectual curiosity and conjecture has a very deep philosophical bearing. It lies at the very sources of Greek thought and it partly explains the more serious anticipations of modern biology and anatomy, and even of anthropology, which arose among the Greeks as early as the sixth century B.C. It classifies the Greeks as men of *western* and *northern* mind and temper rather than of *eastern* or oriental mind and temper, the Greek spirit as restive, eager for new truth, progressive; the oriental spirit as docile, stationary or retrogressive. The Greeks sought *natural* explanations of all origins, from the primordial atoms of Democritus to the final stages in the rise of man. The Orientals, on the other hand, were content with supernatural and mythical explanations of human origin. Except for the great intellectual and scientific uprising among the Arabs of the ninth to the twelfth century, to which we owe the preservation of the writings of Aristotle, the spirit of scientific inquiry little troubled the eastern mind. Even today "Great is Allah!" is the beginning and end of natu-

ral philosophy among the Orientals of the Mediterranean borders, and there is scarcely a rudiment of the idea of gradual upward development, of the slow "rise to Parnassus."

The contrast between the products of western and of eastern reasoning and imagination is brilliantly illustrated by a comparison of two great epics of the fifth century B.C., the western "Prometheus Bound" and the eastern "Book of Job."[1] In the former, Aeschylus, from the rising civilization of Athens, describes man as a son of Mother Earth:

> . . . and thou, earth, mother of all!

while Job, coming from the falling civilization of Ur in Chaldea, pictures man as the very handiwork of the Deity and constantly enjoying supernatural favor. The animals which Job weaves into his great epic belong to Mesopotamia and to Egypt as well as to the great desert lying between the Tigris and Euphrates and the fertile land of Palestine. His natural philosophy is that of pure monotheism; his lofty conception of the spiritual and moral powers of man is that of John Milton; there is no semblance of intellectual curiosity; the earth and all its inhabitants, including man, are under incessant supernatural watchfulness and control:

> But ask now the beasts, and they shall teach thee;
> And the fowls of the air, and they shall tell thee:
> Or speak to the earth, and it shall teach thee;
> And the fishes of the sea shall declare unto thee.
> Who knoweth not in all these,
> That the hand of the Lord hath wrought this?
> In whose hand is the soul of every living thing,
> And the breath of all mankind.
> . . . . . .
> But there is a spirit in man,
> And the breath of the Almighty giveth them understanding.
> . . . . . .
> The spirit of God hath made me,
> And the breath of the Almighty giveth me life.

[1] Compare Osborn: Evolution and Religion in Education, pp. 98–102.

MAN RISES TO PARNASSUS

The Greeks Chiefly Interested in the Origin of Man

Even within the fifth century Greek thought was becoming biological, with the problems of anatomy and the adaptations in structure and function of the human body as centers of speculation and research. The Greek word *Bios* itself, from which the word 'biology'[1] is derived, refers especially to the life of man and was not applied by the Greeks to other living things. As expressed by Singer,[2] "Greek science exhibits throughout its history a peculiar characteristic differentiating it from the modern scientific standpoint. Most of the work of the Greek scientist was done in relation to man. Nature interested him mainly in relation to himself. The Greek scientific and philosophic world was an anthropocentric world, and this comes out in the overwhelming mass of medical as distinct from biological writings that have come down to us. Such, too, is the sentiment expressed by the poets in their descriptions of the animal creation:

> Many wonders there be, but naught more wondrous than man:
> . . . . . .
> The light-witted birds of the air, the beasts of the weald and the wood
> He traps with his woven snare, and the brood of the briny flood.
> Master of cunning he: the savage bull, and the hart
> Who roams the mountain free, are tamed by his infinite art.
> And the shaggy rough-maned steed is broken to bear the bit.
>
> —*Sophocles: Antigone, verses 342 ff.*
> *Translation of F. Storr.*

[1] "The word *Biology* was introduced by Gottfried Reinhold Treviranus (1776–1837) in his *Biologie oder die Philosophie der lebenden Natur*, 6 vols., Göttingen, 1802–1822, and was adopted by J.-B. de Lamarck (1744–1829) in his *Hydrogéologie*, Paris, 1802. It is probable that the first English use of the word in its modern sense is by Sir William Lawrence (1783–1867) in his work *On the Physiology, Zoology, and Natural History of Man*, London, 1819; there are earlier English uses of the word, however, contrasted with *biography*." (Singer: Biology.)

[2] Charles Singer: Biology. Pp. 167, 168; 163, 164 of "The Legacy of Greece."

". . . Where does the science of biology begin? Again we cannot say, but we can watch its evolution and its progress. Among the Greeks the accurate observation of living forms, which is at least one of the essentials of biological science, goes back very far. . . . The Greek people had many roots, racial, cultural, and spiritual, and from them all they inherited various powers and qualities and derived various ideas and traditions. . . . For the earliest biological achievements of Greek peoples we have to rely largely on information gleaned from artistic remains. It is true that we have a few fragments of the works of both Ionian and Italo-Sicilian philosophers, and in them we read of theoretical speculation as to the nature of life and of the soul, and we can thus form some idea of the first attempts of such workers as Alcmæon of Croton (*c.* 500 B.C.) to lay bare the structure of animals by dissection."

There arose numerous mechanical explanations of bodily structures, comparisons between the anatomy of man and of related animals, theories of human heredity similar to that termed 'pangenesis' by Charles Darwin, namely, the assemblage in the germ in each generation of the hereditary forces and influences of the parental body. Related to this rudiment of Darwin's pangenetic theory was a widespread notion that adaptive characters acquired in the body of one generation are transmitted to the germ and thus may reappear in the body of the next generation. From the earliest times, in the comparison of lower animals with man, there arose discussions of the survival of the stronger over the weaker—the rudiment of the Darwinian theory of the survival of the fittest.

The Rise of Anatomy and of Physiology[1]

Inasmuch as the Egyptians were well advanced in anatomy and medicine long before the dawn of Greek civilization, it is not surprising that as early as the seventh century B.C. we have records of the practice of anatomy in Greece. Certainly at a very early date was begun the dissection of the human body and the attribution of physical and psychical functions to various organs of the body. Thus Empedocles of Agrigentum (495–435 B.C.) regarded the blood as the seat of the "innate heat." Agrigentum (the modern Girgenti) was the center of the Sicilian school of medicine which gives us the first hint of human dissection and of the comparison of the hearts of animals with that of man. The distinction of writing the first work on human anatomy belongs to Diocles, who lived in the fourth century B.C. This is on the testimony of the first great anatomist in the modern sense, Galen (130–*c.* 200), although we know the treatises of Hippocrates, whose greatest activity was about 400 B.C., and those of his son-in-law Polybus "On the Nature of Man" and "On the Nature of Bones." The treatise on anatomy by Herophilus is extensively quoted by Galen.

Anatomy and physiology in the modern sense had not advanced very far in the third century B.C., although this was the period of the greatest sculptural attainment of Greece. While the scientific inquiry into anatomy may not have been of great service to the sculptor in the long period which we are considering, it was repeatedly referred to by the natural philosophers of Greece in their attempts to explain the natural origin of many of the most striking

[1] Compare Thompson: Natural Science, and Singer: Biology, Medicine, in "The Legacy of Greece."

adaptations observable in man; for example, the marvelous adaptive structure of the backbone with its many vertebral segments, the perfect adaptation of the four different kinds of teeth which serve four distinct purposes, the perfect adaptation of the human hand to the manifold purposes of industry and art, finally, the intimate relation of the activity of the hand to the activity of the mind.

Attributed to Anaxagoras (500–428 B.C.) is the notion that the uses of the human hand in the various arts have through inheritance played an important part in human intellectual progress:

> Now Anaxagoras says that it is due to his possessing hands that Man is of all things the most intelligent. But it may be argued that he comes into possession of hands *because* of his outstanding intelligence. For hands are a tool, and Nature always allots each tool, just as any sensible man would do, to whosoever is able to make use of it. It is obviously better and simpler to find a man who can play the flute and then supply him with the instrument, rather than to look for a man who happens to possess a flute and then teach him to play upon it.
>
> —*Aristotle: De Partibus Animalium, p. 687a 7.*

Expressed in modern terms, manual training is one of the modes of mental training. In this sense the use of the hand becomes one of the causes of the development of the brain. In my own observation, in the enormously long period of the Stone Age the working of flint tools was the chief stimulus to the working of the mind. So there is a strong prehistoric argument for this thought of Anaxagoras.

The Greeks were prone to seek in the practices and arts of life itself the explanation of the origin of all these adaptations. In other words, they were inclined to the Lamarckian hypothesis that actual experience—contact and struggle with natural forces by various organs of the body—was the cause of naturally arising adaptations. These explanations imply very close observation and intimate

knowledge of anatomy and, especially, repeated observation of the daily exercise of organs and, therefore, of the structure of the organs themselves. This hypothesis of the origin of adaptations through the accumulation by heredity of the beneficial effects of individual effort and exercise has come down through the ages and constitutes a considerable part of biological philosophy even to our own day, that is, of the Lamarck-Spencer idea of the inheritance of physical and intellectual adaptations. Yet modern biology compels us to reject the early Greek idea that adaptive improvement in the working of either the hand or the mind was handed down from father to son by heredity. No generation benefits by the manual or mental skill acquired by its ancestors or through the effects of their life-work; each generation benefits only by the inborn or innate cleverness, resourcefulness or adaptability inherited from its forebears.

The formative power of mind over matter traversed the whole philosophy of Anaxagoras and more or less adumbrates the 'emergent' philosophy of Lloyd Morgan of today. Living creatures were produced from the terrestrial slime when animated by mind, but the 'mind' of Anaxagoras is not mind in our sense of the word. We may credit him with seeking to give a naturalistic explanation, but not in any modern sense was he a naturalist.

A conservative and sound view is that of the German historian of philosophy, Zeller, who rightly remarks that explanations of adaptations in anatomy cannot be advanced until the very conception of adaptation itself had been formulated as the most difficult problem not only in the body of man but in all forms of life. Thus Zeller takes the true scientific view of the teaching of Empedocles, in opposition to Lange, who attributes to Democritus a Dar-

winian interpretation of Empedocles' teaching: "*The attainment of adaptations through the infinitely repeated play of production and annihilation, in which finally that alone survives which bears the guarantee of persistence through its relatively fortuitous constitution.*"[1] Zeller thinks that this could not have been advanced by Empedocles as an explanation of Design in Nature, because the idea of Design had not yet been formulated in the Greek mind. In fact, we should not insert the new wine of modern thought into the old bottles of Greek philosophy.

Another famous Lamarckian passage in Empedocles which successively attracted the attention of Democritus, of Plato, of Aristotle, of Herbert Spencer and of our own natural philosopher William Keith Brooks is referred to by Brooks[2] as follows:

"Herbert Spencer tells us that the segmentation of the backbone is the inherited effect of fractures, caused by bending, but Aristotle has shown ('Parts of Animals,' I.i.) that Empedocles and the ancient writers err in teaching that the bendings to which the backbone has been subjected are the cause of its joints, since the thing to be accounted for is not the presence of joints, but the fitness of the joints for the needs of their possessor."

To those Greek and modern zoologists who regard human nature as the inherited effect of past nurture Brooks[2] says:

"Belief that something is added to our nature by experience, and training, and education, rests on deliberate or unconscious acceptance of some such definition of nature as that which Alciphron gives; and, as the modern zoolo-

[1] Compare Osborn: From the Greeks to Darwin, p. 40.

[2] William Keith Brooks: The Foundations of Zoology, pp. 49, 62.

gist . . . seems to lose sight of Euphranor's analysis of this definition, I beg leave to refresh his memory by a short quotation from the old dialogue.

> "*Euphranor.* You seem very much taken with the beauty of nature. Be pleased to tell me, Alciphron, what those things are which you esteem *natural*, or by what mark I may know them.
>
> "*Alciphron.* For a thing to be natural, for instance, to the mind of man, it must appear originally therein: it must be universal in all men: it must be invariably the same in all nations and ages. These limitations of original, universal, and invariable exclude all those notions of the human mind which are the effect of custom and education."

These passages are intensely interesting because they show that the Lamarckian doctrine now known as the inheritance of acquired characters was discussed with great ability even in the time of Plato (427–347 B.C.).

According to the above citations, the chief influence of the advance of the science of human anatomy on Greek thought between 600 and 300 B.C. was to narrow the problem of the origin of man as a whole as conceived by Anaximander and by Anaxagoras and his followers, to the more intimate anatomical problem of the origin of certain of the more conspicuous adaptations in man, especially those in the skeleton and in the teeth. The idea of sudden or fortuitous development, which we now call 'mutation,' still contested with the idea of the gradual and purposive development of useful organs. This is clearly shown in the discussion by Aristotle of the adaptive origin of the front teeth of man—that is, the cutting or incisor teeth and the piercing eye teeth. Against the fortuitous or chance hypothesis of Empedocles and Democritus, Aristotle advanced his own philosophy of natural causation, which we may seek to understand by a number of concrete examples from his own writings. Unfortunately for our purpose in

these lectures, his observations were far more extended in lower animals and in comparative anatomy than in man.

As cited by the present author[1] from Taylor's translation of Aristotle's "Physics," Aristotle rejects the idea that adaptive structures can be produced by survivals of accidental fitness and substitutes the idea of purposive progress:

"What, then, hinders but that the parts in Nature may also thus arise. For instance, that the teeth should arise from necessity, the front teeth sharp and adapted to divide the food, the grinders broad and adapted to breaking the food into pieces.

"Yet, it may be said that they were not made for this purpose, but that this purposive arrangement came about by chance; and the same reasoning is applied to other parts of the body in which existence for some purpose is apparent. And *it is argued that where all things happened as if they were made for some purpose, being aptly united by chance, these were preserved, but such as were not aptly made, these were lost and still perish*, according to what Empedocles says concerning the bull species with human heads. This, therefore, and similar reasoning, may lead some to doubt on this subject."

Prometheus Voices the Spirit of Discovery

That these fragments of biological discussion are only a part of the whole philosophical discussion of the period is proven in the writings of the great dramatist Aeschylus. As in our own age Balzac and Tennyson gathered inspiration from the current palaeontological and biological discoveries of Cuvier and of Darwin, so Aeschylus, the earliest of the great Greek dramatists, reveals the anthropology and bi-

[1] Osborn: From the Greeks to Darwin, p. 55.

ology of his day. Born in Athens 525 B.C. in the deme of Eleusis, Aeschylus produced his "Prometheus Bound" during the period between the year 479 B.C. and his death in the year 456 B.C.

In this splendid drama the rise of man to Parnassus—the principle of the gradual moral, social, intellectual and spiritual development of man—is as prophetically set forth as it could be in the light of modern discovery. As an introduction to each of the six chapters of this volume we have chosen passages from the scholarly translation of John Stuart Blackie.[1] For the purposes of inspiration we may also express the thought of Aeschylus in the more poetic rendering of Elizabeth Barrett Browning:[2]

. . . List rather to the deeds
I did for mortals; how, being fools before,
REASON: I made them wise and true in aim of soul.
And let me tell you—not as taunting men,
But teaching you the intention of my gifts,
How, first beholding, they beheld in vain,
And hearing, heard not, but, like shapes in dreams,
Mixed all things wildly down the tedious time,
ARCHITECTURE: Nor knew to build a house against the sun
With wickered sides, nor any woodcraft knew,
CAVE LIFE: But lived, like silly ants, beneath the ground
In hollow caves unsunned. There, came to them
No steadfast sign of winter, nor of spring
Flower-perfumed, nor of summer full of fruit,
But blindly and lawlessly they did all things,
ASTRONOMY: Until I taught them how the stars do rise
And set in mystery, and devised for them
MATHEMATICS: Number, the inducer of philosophies,
LITERATURE: The synthesis of Letters, and, beside,
MEMORY: The artificer of all things, Memory,
That sweet Muse-mother. I was first to yoke

[1] John Stuart Blackie: The Lyrical Dramas of Aeschylus.
[2] Elizabeth Barrett Browning: Poetical Works.

DOMESTICATION OF ANIMALS:
The servile beasts in couples, carrying
An heirdom of man's burdens on their backs.
I joined to chariots, steeds, that love the bit
They champ at—the chief pomp of golden ease.

NAVIGATION:
And none but I originated ships,
The seaman's chariots, wandering on the brine
With linen wings. . . . . . .
. . . Hearken the rest,
And marvel further, what more arts and means
I did invent,—this, greatest: if a man

MEDICINE:
Fell sick, there was no cure, nor esculent
Nor chrism nor liquid, but for lack of drugs
Men pined and wasted, till I showed them all
Those mixtures of emollient remedies
Whereby they might be rescued from disease.

AUGURY:
I fixed the various rules of mantic art,
Discerned the vision from the common dream,
Instructed them in vocal auguries
Hard to interpret, and defined as plain
The wayside omens,—flights of crook-clawed birds,—
Showed which are, by their nature, fortunate,
And which not so, and what the food of each,
And what the hates, affections, social needs,
Of all to one another,—taught what sign
Of visceral lightness, coloured to a shade,
May charm the genial gods, and what fair spots
Commend the lung and liver. Burning so
The limbs encased in fat, and the long chine,
I led my mortals on to an art abstruse,

USE OF FIRE AND METALS:
And cleared their eyes to the image in the fire,
Erst filmed in dark. Enough said now of this.
For the other helps of man hid underground,
The iron and the brass, silver and gold,
Can any dare affirm he found them out
Before me? none, I know! unless he choose
To lie in his vaunt. In one word learn the whole,—
That all arts came to mortals from Prometheus.

In summation, let us restate in the scientific and economic language of our day the thought of Aeschylus regarding the gradual rise of man, in the order determined by our present knowledge of the prehistory of man:

The successive phases of human ascent were opened with the gift of language and of a mind conscious of itself and of its powers. This linguistic and reflective stage was followed by powers of observation and of the communication of thought through speech. The first bodily boon of mortals was the discovery of fire, their first life was that of random wandering without any fixed dwelling. Man dwelt in the dark sunless caves of earth, knowing nothing of the art of building in either wood or brick. The seasons passed without record or power of anticipation until the stars were read and revealed the procession of the seasons and years. At the same time arose the use of numbers in calculation and the use of letters whereby man records his shifting thoughts, aided by memory, thus completing his intellectual equipment. For man's higher bodily welfare, following the art of building and the choice of sunward exposure for his homes, came agriculture, aided by the yoking of the ox and the ass and by the harnessing of the horse. Thus on land the labors of man were eased, while on the sea was launched the sail-propelled vessel. Thus was the ephemeral life of man soothed, but to cure disease there remained the discovery of herbs and healing foods, of soothing drugs to check the march of corruption. The final step was to probe the earth, and through its iron, copper, silver, and gold to help man's weakness and crown his arts. Meanwhile the art of divination arose, avoiding those omens fraught with evil and seeking those of blissful augury.

Thus Aeschylus marshals the rise of the intellectual arts of language, observation, comparison and reason, invention, memory, literature, mathematics and astronomy, as well as the practical discoveries of fire, the building of the home, the domestication of animals, agriculture, the build-

ing of boats and navigation, medicine, mining, and the use of metals. In the rise to Parnassus we observe that practically all these human accomplishments belong to prehistory and were in the full tide of human progress before the dawn of recorded history.

This indeed is our chief object—to show how the mind and spirit of man developed through the conquest of one great obstacle after another, in which intelligence rather than brute force always played the guiding part. We shall see how nearly Aeschylus anticipated the principles of modern archaeology, the modern science of prehistory, and our knowledge of the historic rudiments of modern civilization.

II

THE DAWN MAN OF EAST ANGLIA
TRAVELER, HUNTER, FLINT WORKER

PROMETHEUS. . . . Of human kind,
My great offence in aiding them, in teaching
The babe to speak, and rousing torpid mind
To take the grasp of itself—of this I'll talk;
Meaning to mortal men no blame, but only
The true recital of mine own deserts.

. . . . . .

CHORUS. And didst thou chance to advance even beyond this?
PROMETHEUS. Yes! I prevented mortals from foreseeing their doom.
CHO. By finding what remedy for this malady?
PRO. I caused blind hopes to dwell within them.
CHO. In this thou gavest a mighty benefit to mortals.
PRO. Over and above these boons, however, I imparted fire to them.
CHO. And do the creatures of a day now possess bright fire?
PRO. Yes—from which they will moreover learn thoroughly many arts.

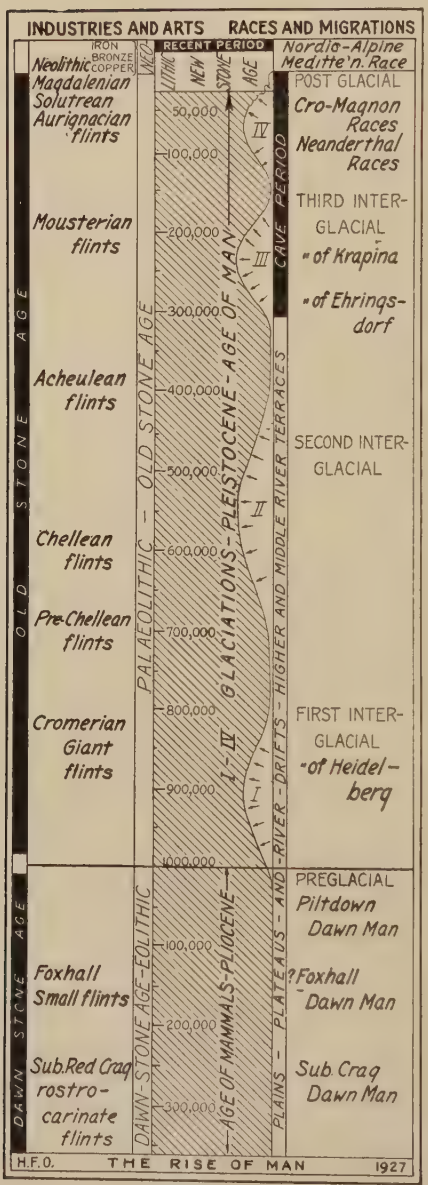
—*Aeschylus: Prometheus Bound.*

THE DAWN MAN OF EAST ANGLIA
TRAVELER, HUNTER, FLINT WORKER

The Dawn Stone Age: Newly discovered evidence of the great antiquity of man — The Bramford flint workers of the Upper Pliocene — The Foxhall Dawn Man found near Ipswich — His flint quarry and fireplace — The Dawn Man of Piltdown, Sussex — The flint implements of Foxhall and Piltdown similar. The Old Stone Age: The giant flints of Cromer mark the beginning of the Old Stone Age and possible ancestry of the Neanderthaloid races of Heidelberg, Krapina, Ehringsdorf and Neanderthal — The Trinil Dawn Man of Java

HARDLY had the twentieth century opened before there began to be found indubitable proofs of the existence of man previous to the Age of Man, not in the long-debated flints known as 'eoliths' or 'dawn-stones,' but in flints of undoubted human workmanship. This astounding discovery occurred on the east coast of Britain, far removed from central Asia, which I believe to be the original homeland of man. Through this discovery two points of the utmost importance are established: First, that man almost from the beginning was a great traveler, hunter and explorer; second, that even in the inconceivably remote past man was a relatively superior being, walking erect, and with very capable tool-making hands guided and directed by a very superior order of brain.

According to these and other discoveries, we now know that man is unbelievably ancient in origin. Just as beyond our universe there are other universes immeasurably distant which yet send their light to the earth, and just as the whole life-period of the earth is credibly reckoned by physicists at 1,000,000,000 years, so now man and his an-



cestors are being traced back over 1,000,000 years to the Dawn Stone Age, in the earlier geologic period of the Age of Mammals.

In this lecture is given some of the new and startling testimony as to man's antiquity. For a hundred and ten years we had been laboriously forging links in the chain of human prehistory, from the beginning of prehistoric time to the very beginning of the Age of Man, but since the year 1909 the goal lines of anthropological research have shifted back into the Age of Mammals, from the Ice Age into the more genial Tertiary period, and the scene of research has

Fig. 1. GEOLOGIC AND ANTHROPOLOGIC TIME SCALE. Left column: Flint industries of the Dawn and Old Stone Ages, in ascending order. Center column: Theoretic time scale based chiefly on the fossil mammals and succession of glaciations I to IV. Observe the long Plateau period and the relatively brief Cave and Recent periods. Right Column: Theoretic succession of flint-making races, in ascending order.

ERA	PERIOD	MINIMUM AGE BASED ON URANIUM-LEAD-HELIUM CONTENT	ROUND NUMBERS FOR REFERENCE
QUATERNARY AGE OF MAN	Recent Pleistocene	1,000,000 years	1,000,000 years
TERTIARY AGE OF MAMMALS	Pliocene Miocene* Oligocene* Eocene*	6,000,000 12,000,000 16,000,000 20,000,000	50,000,000
MESOZOIC AGE OF REPTILES	Cretaceous Comanchian Jurassic Triassic	40,000,000 25,000,000 35,000,000 35,000,000	150,000,000
PALAEOZOIC AMPHIBIANS AND FISHES	Permian Pennsylvanian Mississippian Devonian Silurian Ordovician Cambrian	25,000,000 35,000,000 50,000,000 50,000,000 40,000,000 90,000,000 70,000,000	300,000,000
PRECAMBRIAN BEGINNING OF LIFE ON THE EARTH		1,000,000,000	1,000,000,000

Recent geologic time table, in which the whole geologic life-period of the earth is estimated at a thousand million years and subdivided as above. After W. A. Parks, F.R.S.C.; published in 1926 by the Royal Society of Canada.

Fossil remains of man are now known in the entire Quaternary Age of Man era and in the upper part of the Tertiary Pliocene period.

*The Miocene, Oligocene and Eocene beds are entirely wanting in the region of East Anglia; the Pliocene beds lie immediately on top of the Cretaceous.

TABLE I

shifted from France on the River Somme to England on the River Ouse and on that part of the coast known as East Anglia.

I. THE DAWN STONE AGE

The coast of East Anglia is replete with historic interest, for here the Britons of old under Queen Boadicea made their last stand against the Roman legions. But this and other recorded history seems very recent indeed if we con-

trast it with the prehistoric records of past ages embedded in the cliffs of Cromer and the adjacent deposits. This Pliocene region first aroused my interest by its fossil fauna when, in the year 1920, I attempted to define its very important fossil animal levels and those of the various 'Crag' deposits of the warm Pliocene waters bathing the coast of eastern England during the Age of Mammals.

Fig. 2. GEOGRAPHIC CENTERS IN FRANCE AND ENGLAND, where dwelt the flint workers of the Old Stone Age along the River Somme, and of the Dawn Stone Age along the Thames and coast of East Anglia. Sunken channel and coast lines as they are today.

To get a clear idea of truly ancient geography we must realize that in Pliocene times a north continental shore-line extended westward and united Europe with England where the English Channel now is. Along this ancient coast man found his way into England in Pliocene times and there left traces of his camps in his recently discovered handiwork—the Cromer, Foxhall and sub-Red Crag flint implements.

The genial Pliocene climate of East Anglia was succeeded by a boreal sub-arctic climate as the long elevated

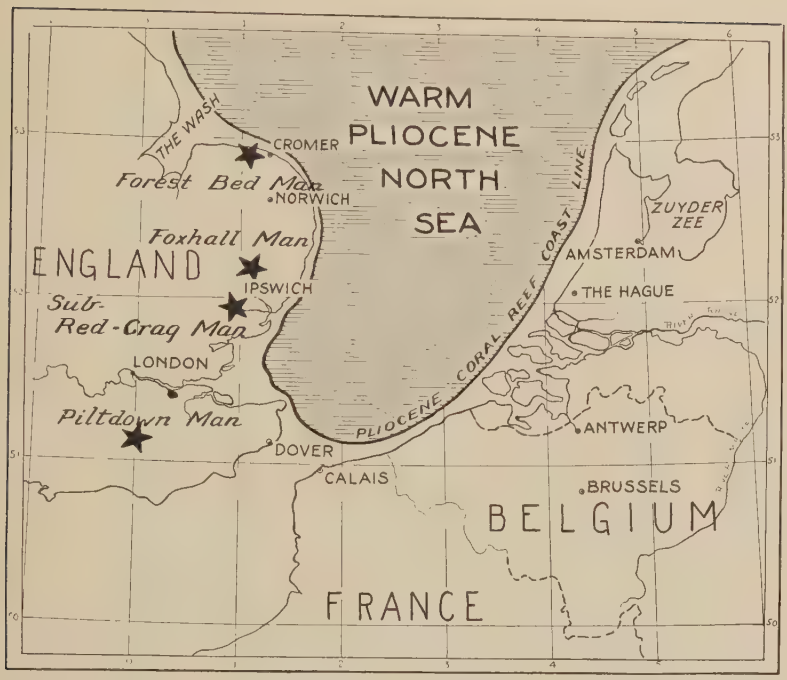


Fig. 3. Recently Discovered Flint-Working Area of the Dawn Stone Age, extending over the Piltdown region of Sussex northward from Ipswich to Norwich and Cromer, the present area of East Anglia. On the very ground where Cardinal Wolsey played as a boy around Ipswich, the youth of the *Foxhall* and *sub-Red Crag* of Bramford worked around the fireplaces, learning to fashion their flint implements, at least 700,000 years ago. To the south of London were the youth of the *Piltdown* race. To the north were the flint makers of *Cromer*, possibly of the same giant race and geologic age as the men of Heidelberg to the east of the River Rhine.

chalky coast sank below the level of the North Sea. In all the northern hemisphere the Tertiary Age of Mammals closes in glacial time with a great cold wave on land and sea and with an arctic invasion of animals and plants which introduce the Quaternary Age of Man. As described by Sir Archibald Geikie in 1882,[1] in the closing Pliocene period of Britain, after long ages of exposure of East Anglia as a land surface during which a continuous and

[1] Archibald Geikie: Textbook of Geology, pp. 872–873.

ultimately stupendous subaerial denudation of Cretaceous Chalk Beds was in progress, the land underwent a gentle but local subsidence. We have no evidence of the extent of this depression; all that can be affirmed is that the southeastern counties of England began to subside, and on their submerged surface some sandbanks and shelly deposits were laid down, very much as similar accumulations now take place on the bottom of the North Sea. These formations are subdivided, according to their proportion of fossil and living species of shells, into the following groups:

	AGE OF MAN			
Pleistocene	Cromer Forest Bed Group . 10 to 70 ft.			
Transition to Glacial Age	Chillesford beds [Molluscs of Arctic Seas]			
	Chillesford Clay [=Weybourn Crag] . . . . . 1 " 8 "			
	Chillesford Sand with shells . 5 " 8 "			
	AGE OF MAMMALS			
Pliocene	Norwich Crag . . . . . 5 " 10 "		19	11
	Red Crag . . . . . 25 "		23	32
	White Crag . . . . . 40 " 60 "		14	65
			Northern Species	Southern Species
	AGE OF REPTILES			
Cretaceous	Chalk Beds, containing *flint* pebbles and nodules.			

Of these crag deposits, the oldest is the Pliocene 'White Crag,' a coralline or bryozoan formation exposed in many places in the county of Suffolk; it indicates a sea and land temperature about like that of Nassau and the Bahama Islands of today and it consists of shelly sands and marls containing 316 species of shells, of which 84 per cent. are still living.

Fig. 4. Sir E. Ray Lankester, veteran zoologist surviving from the great Victorian age of British science, who has encouraged the work of Moir and lent his authority to the theory of human origin of the Upper Pliocene flints of East Anglia, especially the rostro-carinates of the sub-Red Crag.

Fig. 5. J. Reid Moir, archaeologist of Ipswich, who since 1909 has successively discovered the sub-Red Crag flints in the Bramford quarry, the Foxhall flint-making floor of Ipswich and the Cromer quarries of Norfolk, and has demonstrated the existence of intelligent flint workers and fire makers at the close of the Age of Mammals, Pliocene time.

Next above comes the 'Red Crag,' also a thin and local formation, consisting of a dark-red or brown ferruginous shelly sand; of its molluscs, 92 per cent. are believed to be still living species, and out of 25 species of corals, 14 are still natives of British seas. It is at the *very base* of the Red Crag that the earliest stone flints of human manufacture have been found.

The 'Norwich Crag' follows, with its fluvio-marine and mammaliferous fauna; among its molluscs, 93 per cent. of which represent forms still existing, we note certain northern species which we may regard as indicative of the coming Arctic invasion.

Beneath the Pliocene deposits above mentioned, extending from the white cliffs of Dover, lies the Chalk of the Cretaceous Age, wherein were embedded flint pebbles and nodules which, to primitive man, with his crude stone implements, were a great attraction. The Stone Age man traveled far and wide in search of flints, just as our more recent ancestors sought deposits of copper and tin.

Overlying the Pliocene crags are the Chillesford Sands and Clay and the contemporary 'Weybourn Crag' (exposed near Ipswich), which open the Age of Man; here we observe signs of a marked refrigeration of the waters along that part of the coast, for two-thirds of the molluscs represented belong to forms which still exist in Arctic waters, thus identifying this period with the oncoming First Glacial Stage of western Europe.

The still more recent Cromer Forest Bed deposits of the early Age of Man denote a sensible amelioration of climate, synchronous with the First Interglacial stage of western Europe and perhaps with the period of the Heidelberg man of the Rhine region.

	ENGLAND		JAVA
	East Anglia	Sussex and Kent plateaus	Sands of the Trinil River
Glacial (I-IV) *Age* *Pleistocene* QUATERNARY	CROMER MAN OF NORFOLK, known by flints only; in the 'Forest Bed group'		TRINIL MAN OF JAVA
Beginning of the Age of Man			
Close of the Age of Mammals	FOXHALL MAN OF IPSWICH, known only by flints and fireplaces; in the Red Crag	PILTDOWN MAN OF SUSSEX	
Pliocene Age TERTIARY	SUB-RED CRAG MAN OF BRAMFORD, known by rostro-carinate and other flints	[Pliocene Age still disputed]	

TABLE II

The 'Bramford' or Sub-Red Crag Flint Workers

The discovery of the Pliocene sub-Red Crag flint beds of the Bramford Dawn Man is due to a merchant of Ipswich, J. Reid Moir, who was attracted casually by a flint which he picked up on a local exploring trip in 1909 in company with a geologist. The flint appeared to Moir to be humanly fashioned, and he immediately began to devote his spare time to further search for such objects, which he conceived to be remains of early man. The flint implements which he found lay beneath or at the very base of the Red Crag, which implied a geologic age so great as to make the idea of human agency impossible in the judgment of the scientific world. For a long time Moir received no encouragement, except from the veteran Sir Ray Lankester and from my own acceptance of his discovery at Foxhall in the *London*

Times; but with the courage of his convictions he worked on, in the face of ridicule, collecting the unique flint implements, which Lankester named 'rostro-carinate'[1] (beak-keeled), to describe their curious form, and, later, the Pliocene flint implements of the type known as 'Foxhall.'

On a visit to the British Museum a few years ago I inquired about the rostro-carinates and was told, "Oh, we don't admit those." But now the recently published "Guide to the Stone Age Antiquities of the British Museum," by Keeper Reginald Smith, gives excellent figures and a full description of the very rostro-carinates that formerly were

Fig. 6. SIDE VIEW OF LARGE ROSTRO-CARINATE discovered in the sub-Red Crag of the Bramford quarry. After Lankester, 1921, Pl. 10. *Cort.* An area of cortex or original bark of the nodule. 2, 3, 4. Scars whence ribbon-like flakes have been struck; scars 3 and 4 are noticeable for the conchoidal transverse rippling of the flint. 5. The scar of a broader flake, parallel to 2, 3, 4, which is truncated by the well-marked conchoidal scar, 6, of another shaping-flake.

"not admitted." I myself hesitated in 1921 to admit them, although I did admit the human origin of the Foxhall flints and wrote at length to the *London Times* concerning them. Following this, Abbé Henri Breuil and Dr. Louis Capitan, two of the foremost archaeologists of France, visited the Foxhall site, and, after a searching investigation, pronounced the flints to be genuine artifacts. During the past year they have also somewhat reluctantly admitted

[1] From *rostrum*, beak, and *carina*, keel.

the rostro-carinates to be indubitable artifacts of human origin.

The rostro-carinates are found at the base of the Red Crag and on the very top of the far more ancient Cretaceous or Chalk bed, the deposit being characterized by abundant fauna of southern elephants and rhinoceroses and by very rare flints. Their use is only conjectural; I have suggested that they might well have been used in removing the hide from an animal, the flat surface pushing in between the flesh and the skin, and the sharp 'keel' cutting the skin.

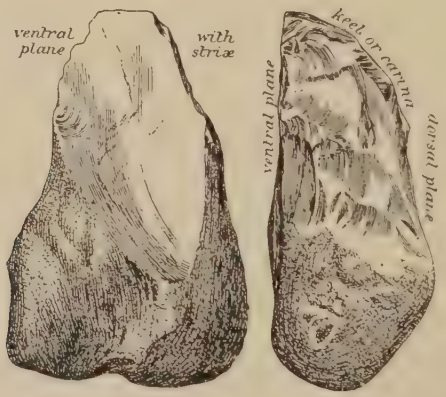


Fig. 7. A ROSTRO-CARINATE FROM THE SUB-RED CRAG, showing the ventral plane made by a single blow, the keel or carina, the dorsal plane, and the smooth round surface to be grasped by the hand. 1-3 natural size. After Reginald A. Smith, 1925.

The rostro-carinate implements are known by Lankester and Moir to represent artifacts of a still earlier stage than those either of Foxhall or of Cromer. Of the men that produced these flints Moir writes:[1] "The pre-Crag people . . . had an abundance of flint of very fine quality, in the form of nodules, with which to work, but the more or less

[1] J. Reid Moir: Pre-Palaeolithic Man, 1920, pp. 1–67, I–XXIX.

rounded surfaces of nodules did not afford a satisfactory striking-platform, and so they had to learn to provide themselves, by flaking, with a flat surface upon which blows could be struck with precision. . . . The ventral surface of the rostro-carinate formed by the removal of a large flake from the original flint nodule, represents the natural flat surface of tabular flint, and in both cases blows were delivered on each side of this flat surface. . . . In the rostro-carinate the keel or gable seems to have been the desired object."

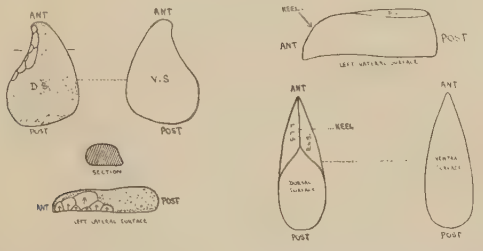


Fig. 8. Interpretations by J. Reid Moir of Pliocene Flint Industry Stages. *Left*: Most primitive stage, with seven small flakes struck off the left lateral surface. *Right*: How the beak-keeled rostro-carinate was fashioned by the sub-Red Crag flint workers. 1-3 natural size. After Moir, 1920, Pls. V, IV.

Lankester defines the ideal rostro-carinate as an implement with broad posterior region, narrowed anteriorly to a quasi-vertical cutting edge. This anterior narrow edge is strongly curved and gives the implement the form of the beak of an accipitrine bird. The form of this region of the implement may also be compared to that of the prow of a boat with the keel turned upward. If the implement is held with the prow or beak to the front, there are observed an upper or dorsal plane, a lower or ventral plane, a right lateral and left lateral surface, a posterior surface or stern, and an anterior surface.

According to Moir the rostro-carinate of the sub-Red

Crag has evolved from two antecedent stages, followed by four succeeding stages in the last of which the rostro-carinate pattern almost disappears. In his valuable treatise, "Pre-Palaeolithic Man," Moir describes his theory of the early evolution of the flint industry. Moir herein maintains that the Piltdown man—the *Eoanthropus* of Smith Woodward—was of Upper Pliocene age and was possibly the maker of the types of flints found at Foxhall.

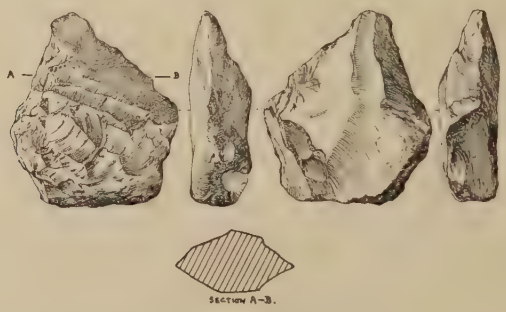


Fig. 9. PRIMITIVE SPEARHEAD or flint weapon worked on both faces, found in the sub-Red Crag quarry of Bramford (see Fig. 10), an implement geologically older than any from Foxhall (see Fig. 15). 1-3 natural size. After Reginald A. Smith.

The discoveries by J. Reid Moir of evidences of the existence of Pliocene man in East Anglia accordingly opened a new epoch in archaeology, in which the southeastern corner of Great Britain is destined to play a very important part. In their bearing on the rise of man these discoveries are no less revolutionary, because they bring indubitable evidence of the existence of man in southeast Britain, man of sufficient intelligence to fashion flints and to build a fire, before the close of Pliocene time and before the advent of the First Glaciation, which opens the Pleistocene or Quaternary history of man. That is, we have at last found in the

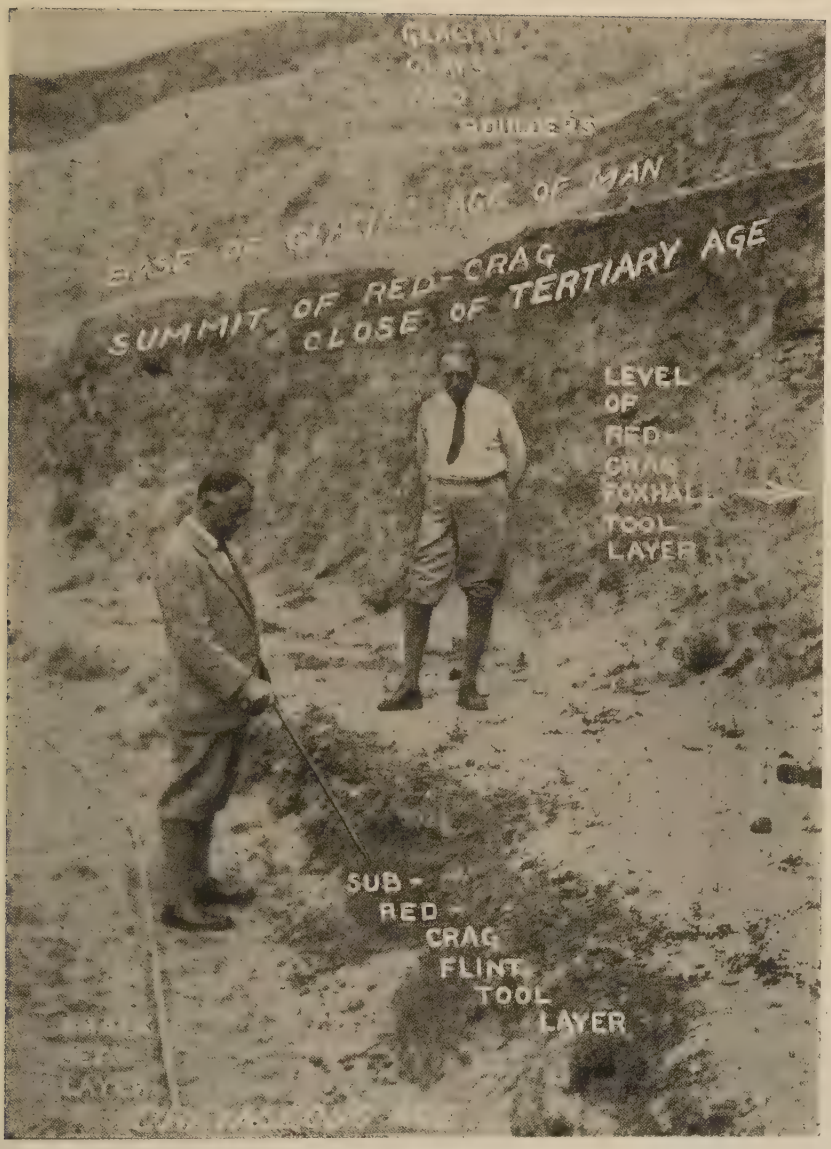


Fig. 10. In the Bramford Quarry near Ipswich. J. Reid Moir pointing to the sub-Red Crag flint-tool layer of Pliocene age, by far the most ancient evidence of man thus far discovered; here were found the rostro-carinates and other implements shown in Figs. 6, 7, 8, 9. The author stands on the level of the Foxhall flint-tool layer, under the Red Crag summit.

Fig. 11. In the Heart of the Foxhall Quarry near Ipswich. J. Reid Moir pointing to the 16-foot flint-tool and fireplace level. The site represents a flint-making camp of the Foxhall Dawn Man. The small-flint industry (see Fig. 15) found here was very different from that at the base of the Red Crag. Some of the flints give evidence of exposure to fire.

Foxhall flints proofs of the existence of real *Tertiary man*, of geologic age exceeding a million years.

	Advances of the Great Scandinavian Glaciers into Northern Europe	Succession of Flint Industries and Human Races
	Postglacial Time	*Aurignacian-Magdalenian Industry*, CRO-MAGNON RACE
Pleistocene	IV. FOURTH GLACIAL TIME	*Mousterian Industry*, NEANDERTHAL RACE
	3rd Interglacial Time	*Acheulean Industry*, (1) warm and (2) cold
	III. THIRD GLACIAL TIME	*Chellean Industry*, warm mammal fauna of northern France and England. The Chellean Industry (Boucher de Perthes, 1846), is now regarded as beginning (*pre-Chellean* phase) in *2nd Interglacial Time*
	2nd Interglacial Time	
	II. SECOND GLACIAL TIME	*Pre-Chellean Industry* discovered in France in this very long period of geologic time. The HEIDELBERG man (Germany) and scattered primitive industrial flake flints are referred to this period
	1st Interglacial Time	
Quaternary	I. FIRST GLACIAL TIME	*Flint Industry* of the CROMER RACE, Norfolk, England
		(3) The Piltdown DAWN MAN of Sussex and associated *flint implements*
	UPPER PLIOCENE TIME	(2) *Flint Industry* of the Foxhall DAWN MAN, Ipswich, Suffolk, England
Tertiary		(1) *Sub-Red Crag Industry*, Bramford quarry, Ipswich, Suffolk, England

TABLE III

This discovery of man in Pliocene time delights the present author for a personal reason, namely, because it tends to render somewhat more probable his prophecy made in April, 1921, before the National Academy of Sciences at

Washington that one of the great surprises in store for us in science is the future discovery of Pliocene man with a large brain. At present, however, we know nothing of the brain weight and little of the intelligence of the Dawn Man who fashioned the flints of the sub-Red Crag and of Foxhall, unless the Piltdown flint workers are of Foxhall age.

Discovery of the "Fossil Human Jaw from Suffolk"

In 1920 Moir directed attention[1] to a paper, long forgotten and almost lost sight of, which appeared in the *Anthropological Review* of 1867, entitled, "The Fossil Human Jaw from Suffolk," by R. H. Collyer, M.D.,[2] in which occurs the following statement: "At the instigation of Vice-Admiral Sir Edward Belcher, C.B., I was induced to exhibit to the Ethnological Society of London in April 1863, a fossil or coprolite human jaw, which was found by the workers employed in excavating coprolites near Ipswich, Suffolk. The jaw was purchased from the finder by Mr. John Taylor, druggist, of Ipswich, for the sum of 2*s.* 6*d.*, who called my attention to it at the time, 1855. . . . The specific gravity [of the jaw bone] is much greater than that of a recent bone of the like size, it being infiltrated throughout its entirety with oxide of iron, and the surface presents peculiar metallic lustre. . . . I have now every reason to believe that this 'coprolite jaw' is the oldest relic of the human animal in existence, as its condition corresponds in every respect with the coprolites in whose contact it was found."

[1]J. Reid Moir: Further Discoveries of Humanly-Fashioned Flints in and beneath the Red Crag of Suffolk. Reprint *Prehist. Soc. East Anglia* for 1920–1921, pp. 1–42, Pls. I–III, V, Figs. 1–45A.

[2]Robert H. Collyer: The Fossil Human Jaw from Suffolk. *Anthropological Review*, Vol. V, No. XVII, April, 1867, pp. 221–229.

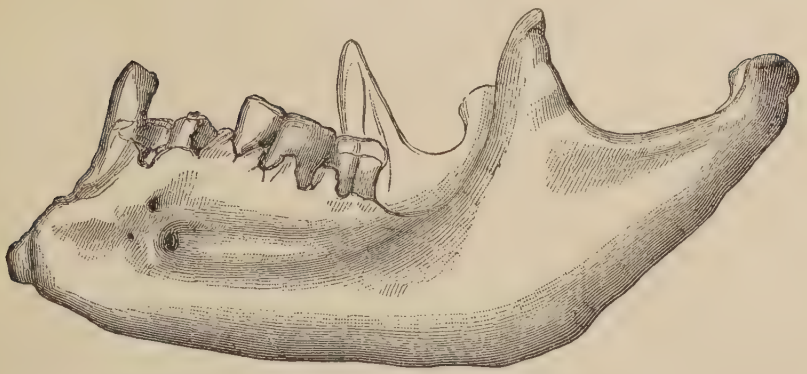


Fig. 12. ALLEGED HUMAN JAW recorded and figured by Collyer in 1867 as having been found by workmen in the 16-foot level of the Foxhall quarry (see Fig. 13). 2-3 natural size.

The history of this jaw, as narrated by Moir from Dr. Collyer's original paper, reads like a romance. Collyer was an American physician resident for many years in London. A man of exceptional intelligence, he became convinced that the jaw was a true fossil and that its geologic antiquity could be established beyond question. Like the Piltdown skull of 1911, the Foxhall jaw of 1855 had been found by workmen. In their search for fertilizing material, the jaw was recovered in a roadside dump and was presented to Collyer in 1857. The best record of the alleged find is in a letter dated November 13, 1866, to Dr. R. H. Collyer from Mr. John Taylor, the original purchaser of the specimen from the workman in 1855: "From what I could learn at the time, from the agricultural labourer of whom I bought it, it came from the coprolite pit on the farm of Mr. Laws at Foxhall, about four miles from Ipswich, and was thrown out at Mr. Packard's manure factory with the coprolite from a cart or tumbril, and from thence was brought to me to secure a glass of beer. . . . There is no doubt the bone was obtained at some depth . . . as I

know the pit had been open for a considerable time when it was found." Collyer visited the locality where the material was procured and noted that the quarry was *sixteen feet* below the surface.

During the succeeding decade Dr. Collyer took the very steps we would take today by submitting the jaw for examination to the leading experts of England and France. In 1857 he showed it to Quekett, curator of the Royal College of Surgeons, and on Quekett's suggestion, to Richard Owen, the leading comparative anatomist of Great Britain, who kept it two years without expressing any opinion. In 1859 Collyer submitted it to the geologist Prestwich, the first British authority to support Boucher de Perthes' discovery of Chellean man in France. Four years elapsed, during which appeared Sir Charles Lyell's work on "The Antiquity of Man" (1863), which led Collyer to take the jaw to Huxley, at the time foremost advocate of evolution and subsequent author of "Man's Place in Nature"; Huxley rightly pronounced the jaw of modern type. Later, at a meeting of the Ethnological Society (April, 1863), at which were present the great geologists Charles Lyell and Roderick Murchison, the palaeontologist George Busk stated that Collyer's specimen was "the jaw of some old woman, perhaps from some Roman burial ground." Huxley, who was present at this meeting, called on Collyer the following morning and pronounced the jaw to be a "most extraordinary specimen"; finally, however, Huxley wrote (May, 1863) to Collyer that the jaw bone showed "some peculiar characters," which, however, did not appear to him to be in themselves adequate to lead him to ascribe the bone "to an extinct or aberrant race of mankind, and the condition of the bone is not such as I should expect a crag

fossil to be." Undiscouraged by Huxley's adverse opinion, Collyer submitted the jaw to the palaeontologists Hugh Falconer and Busk, who took it to Paris for submittal to Quatrefages and other French anatomists. Busk modified his original opinion and wrote (July, 1863) that he regarded the jaw as of "very great antiquity."

In brief, Collyer submitted his 'coprolite jaw' to every great geologist and comparative anatomist of the time, but the results were mainly negative, probably *because the shape of the jaw was not primitive but modern*, with a prominent chin process, and the degree of mineralization was not such as positively to prove it a fossil. He had a chemical analysis made which showed that the jaw was largely mineralized or fossilized, but retained eight per cent. of animal matter. As to the degree of fossilization, Busk agreed with Huxley that the jaw was of modern form, ". . . of course, without any relation as regards age with the fossil bones of the coprolite beds; it [the jaw] is of *very great antiquity*." On this question Moir reports that, on chemical analysis, it is found that some of the Red Crag bones contain as little as six and one-half per cent. of organic matter as compared with the eight per cent. reported in the Foxhall jaw.

With our present knowledge and experience, it is difficult to understand why these great geologists and comparative anatomists did not immediately visit the spot from which the jaw was recorded, establish or disprove its geologic age, and endeavor to ascertain whether there was any reasonable doubt as to its actually having been found at the spot indicated. But Collyer was left alone with his discovery. He disappeared from scientific meetings and at the present writing we have no further record of either the

enterprising doctor or the alleged Foxhall jaw. From inquiries instituted by Moir, it appears that Collyer was a graduate of the Berkshire School of Medicine, formerly at Pittsfield, Massachusetts, and a personal friend of the American craniologist, Dr. Morton, of the Academy of Natural Sciences of Philadelphia, with whom he corresponded about the jaw. It is hoped that, following up these clues, it may be possible to trace the history of Dr. Collyer after 1867, and, furthermore, that there may be a possibility of our recovering the lost Foxhall jaw.

It would be hazardous for the present author even to express an opinion as to whether this jaw is of Pliocene age and contemporaneous with the great southern mammoth and other South Temperate fossil mammals. The imperfect figure reproduced from Collyer shows it to be different from the two most ancient jaws we know, namely, those of the chinless Piltdown and Heidelberg men, for it apparently *had a prominent chin*. It is possible that the mineralization of the jaw was due to deep intrusive burial. To settle these questions the *jaw must be traced and found*. Even if the jaw proves to belong to a modern race of man rather than to the Foxhall race, Dr. Collyer's paper has suddenly become a classic because it has led to the long awaited discovery of Tertiary man, which may now be described.

Discovery of the Dawn Man Flint Quarry and Fireplace of Foxhall near Ipswich

It remained for Moir, half a century later, to unearth Collyer's paper of 1867, to vindicate his entire procedure, and above all to rediscover the actual *sixteen-foot* level at Foxhall in which Dr. Collyer believed the jaw was located. "I found to my surprise," writes Moir, ". . . the occur-

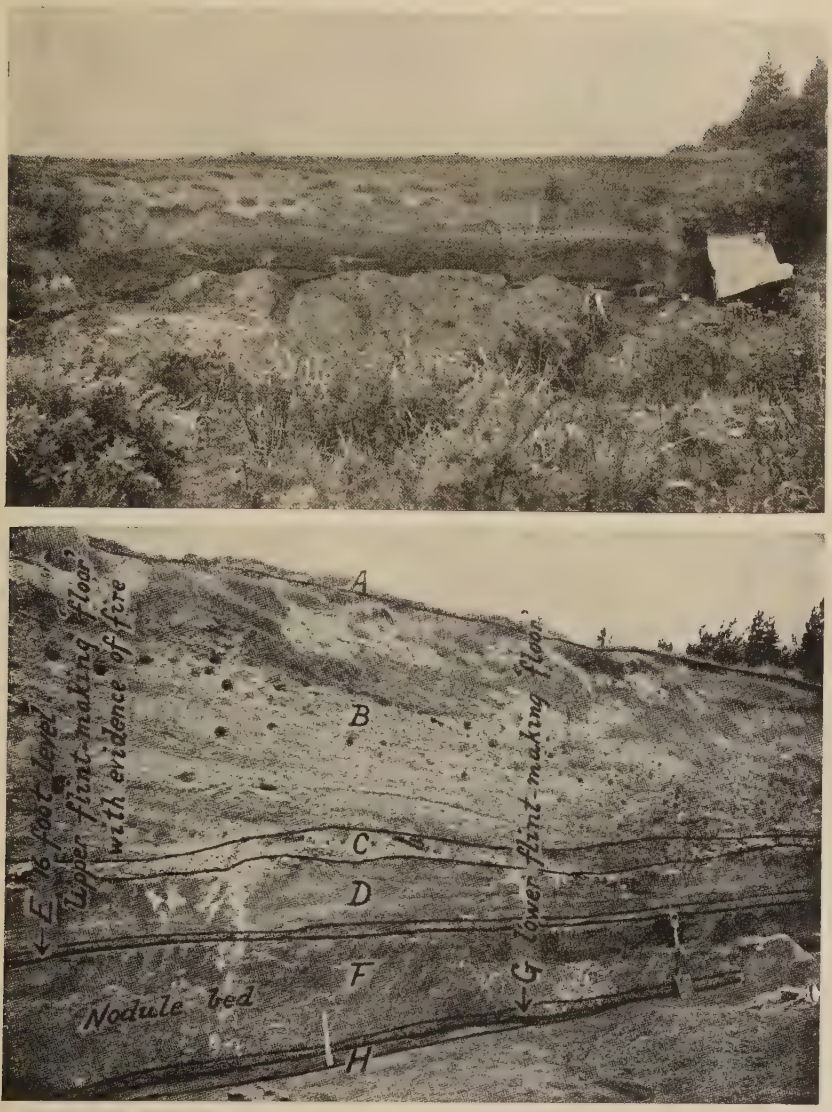


Fig. 13. Great Foxhall Quarry near Ipswich. *Upper*: Spot where Collyer recorded the find of a human jaw in 1855; the canvas at right covers spot where J. Reid Moir discovered the fireplace and the Foxhall flints in 1920.

Lower: Western face of the Foxhall pit, in which the industrial flint layers "E" and "G" were discovered; on the 16-foot level indicated by the left arrow were found the Foxhall flints (Fig. 15) and evidence of the use of fire.

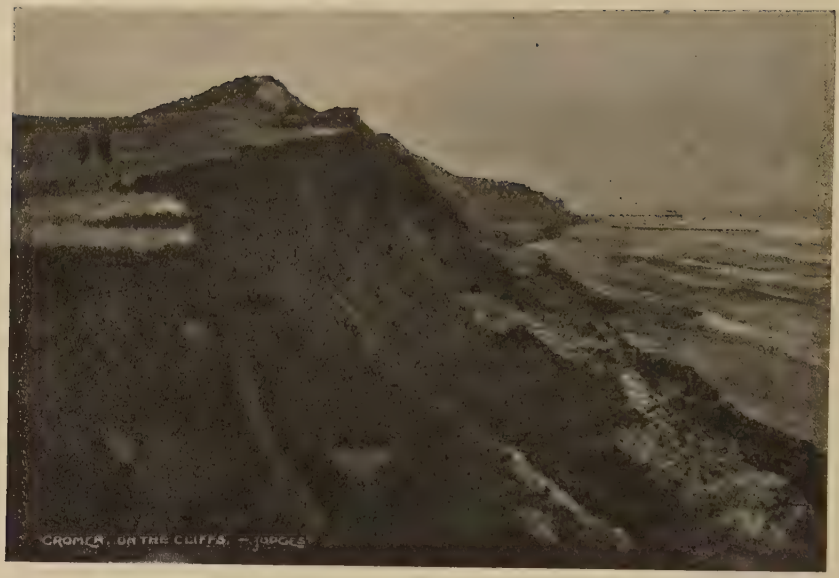


Fig. 14. Pleistocene Cliffs of Cromer, Norfolk. All along this beach at low tide are exposed the Forest Bed deposits of Lower Pleistocene age, which yield quantities of fossil mammals. *Upper*: The flint-working 'floor' where the giant flints are found extends just beyond the pier; since the 'floor' is below the level of the Cromer Forest Bed it is seen best at very low tide. (See Fig. 26.)

rence of a nodule-bed lying in the [Red] Crag itself . . . and that this nodule-bed rested at a depth of sixteen feet below the surface." The exact correspondence, so far as depth from the surface is concerned, between the nodule-bed mentioned by Collyer and that described in a Survey Memoir,[1] enabled Moir to trace the quarry to Mr. Laws' farm, mentioned by Collyer as in the parish of Foxhall. Moir continues: "I decided to investigate the nodule-bed. . . . *My investigations have resulted in the discovery of a definite occupation level at this horizon, containing cores, flakes, flint implements, and a number of stones exhibiting crackling and other evidences of having been subjected to the action of fire.*" [Italics my own.]

It thus appears that Collyer's notes on the *sixteen-foot* level of the quarry, by attracting the intelligent archaeologist of Ipswich, led to what we have described as the opening of a new epoch in prehistory. To support this strong statement, let us compare the geologic age (See Tables I, II, III, and Fig. 2) of the Foxhall flints with that of the flints discovered in 1846 by Boucher de Perthes at Chelles, France, at a geographic point approximately 230 miles southeast of Foxhall, England, the two localities in Stone Age time being united by a broad and fertile land connection. The most ancient of the Chellean flints are of much more recent time than those of Foxhall, because the greatest antiquity assigned to them by geologists is that of mid-Pleistocene time, whereas the Foxhall flints occur in the Upper Pliocene *before the beginning of Pleistocene time*. Thus the long interval of Lower Pleistocene time separates the Foxhall from the Chellean, during which the upper and

[1] The Geology of the Country around Ipswich, Harleigh, and Felixstowe. *Mem. Geol. Surv. United Kingdom* (explanation quarter-sheets), 1885.

middle river terraces of France and England were formed and important changes in the mammalian life occurred.

The makers of the Foxhall flints had their 'floor' or 'atelier' very near the shore of the North Sea in Pliocene time. The 'floor' is not in the *base* of the Red Crag but in the middle of Red Crag sand deposits partly of river and partly of marine origin, which mark a very long period of time and a very gradual change of climate in this part of England from warmer to cooler conditions. In the lowest levels of the Red Crag is found the warm Pliocene fauna of the three-toed *Hipparion* horse, the tapir, the short-jawed mastodon, the hippopotamus, and the roe deer, while in the upper levels occur the remains of a newer temperate fauna of true horses (*Equus stenonis*) and of the southern mammoth (*Elephas meridionalis*). Moir writes, August 11, 1921, apropos of a visit to the locality by Professor J. E. Marr, the geologist of Oxford University: "There is no question as to the Pliocene age of the Foxhall levels—so long as you continue to regard the Red Crag as Pliocene. But the 'floors' at Foxhall occur *in* the Crag, not at the base as in the case of the ordinary detritus bed." From the ground level at the Foxhall Quarry occur the following beds (Fig. 13, lower):

RECENT	A. Surface soil, 6 inches to 1 foot in depth.
QUATERNARY	B. Stratified 'middle' glacial gravel 10-12 feet in thickness.
TERTIARY	C. Fossiliferous iron-stone bed, 6-9 inches in thickness.
Pliocene Red Crag	D. RED CRAG sand, horizontally stratified, 2-3 feet in thickness.

E. Sixteen-foot level of Collyer. Black band with many casts of shells and *flint implements*, flint flakes, also 'coprolites' and fossilized [Red Crag] bones, 2-3 inches in thickness. [See handle of shovel shown in the illustration.]

F. *Nodule-bed* or gravel pit, horizontally stratified, containing coprolites, but *almost devoid of flints*, and 2-3 feet in thickness. [This is the bed quarried for fertilizing purposes, in which it is alleged that the '*Foxhall jaw*' was found.]

G. Lower black band, not quite so well defined as "E," containing dark-colored, worked flints. [See bottom of measuring rod shown in the illustration.]

It is the level "E" which Moir describes as "*a definite occupation level . . . containing cores, flakes, flint implements, and a number of stones exhibiting crackling and other evidences of having been subjected to the action of fire.*" It is these flints, discovered by Moir and identified as of human origin by Abbé Breuil, the famous French archaeologist, which firmly establish the existence of Pliocene man in Britain.

That this was a flint-working 'floor' is indicated by the presence of the flint cores and flakes with the flint implements themselves. The débris of this flint-working floor appears to point to a time during the laying down of the Red Crag deposits, when for a short period, geologically speaking, a land surface in the form of a shore line existed at this site. The majority of the humanly flaked flints from

both the upper and the lower levels, namely, "E" and "F," appear to belong to the same industrial stage. It may be, also, that after a more or less prolonged occupation of level "F," the incursion of the waters of the North Sea in late Red Crag time caused the ancient flint workers to abandon their working site. Later, however, they returned to the same spot and worked on the upper surface of the nodule bed, two or three feet in thickness. Finally, the upper floor

Fig. 15. Five Flint Implements from the 16-foot Level of the Foxhall Quarry and One from the sub-Red Crag of Bramford. After Moir, 1920-1921. 12, 12A: Primitive arrowhead type, flaked on both sides, which may have been used in the chase. 13, 13A: Primitive (?) *coup de poing* or hand axe, flaked on both sides. 17, 17A, 17B: Primitive *râcloir* or scraper, extremely large, which may have been used in preparing skins. 19, 19A: Primitive *pointe* or spearhead. 21, 21A: Primitive *perçoir* or borer. 45, 45A: Primitive (?) *coup de poing* or hand stone from the sub-Red Crag.

was in its turn sunk below sea level and covered by a further deposition of marine sand and shells.

These Foxhallian flints are unlike those of the Chellean of France—they are chiefly fashioned from flakes and not from the 'cores.' Moir supposes that the almost pure white color is due to prolonged surface exposure of the 'floor,' because the flints lack the dark mahogany-brown coloration characteristic of the detritus layers of the sub-Red Crag; only a few flaked flints of this dark color have been found. The known typical implements (Fig. 15) of the sixteen-foot level are not unlike those of much less antiquity than the Red Crag. Moir describes the flint tools and weapons as less coarse than the mahogany-brown specimens in the lower level. They include hafted specimens, side scrapers resembling the *râcloirs* of early Mousterian time, a number of arrowhead-like *pointes*, also borers and scrapers of the ordinary type. A number of flints calcined by fire are also found. Only one specimen of a rostro-carinate implement, of indifferent manufacture, was found during the excavations at Foxhall.

Eoanthropus, The Dawn Man of Piltdown, Sussex

Having now considered the Bramford man, maker of the rostro-carinate flints, and the Foxhall man, maker of five kinds of small flints and the discoverer of fire, let us examine the better known Dawn Man of Piltdown, who probably belonged also to the Pliocene period and may have been contemporaneous with the Foxhall flint maker.

Eoanthropus, the 'dawn man' of Piltdown, discovered in 1911 on the 'weald' of Sussex, has had a battle royal for recognition by the scientific world. Since the first fragments of his skull were reported by the geologist, Charles

Dawson, and first made known to the scientific world in 1913[1] by Dawson and by Arthur Smith Woodward, Keeper of Fossils in the British Museum, the contest of opinion has been long and heated and at times acrimonious. Over a few fragments of skull bone, three lower teeth and a portion of

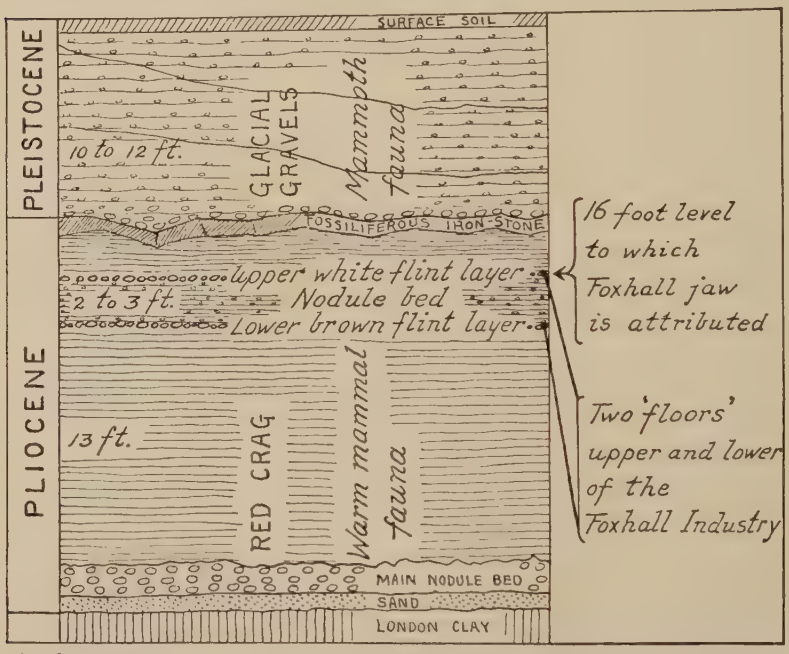


Fig. 16. Diagrammatic Section of the Face of the Foxhall Quarry (Fig. 13) where the Foxhall flints (Fig. 15) were discovered; this is seen to be in the middle of the Red Crag at the 16-foot level to which Collyer attributed the Foxhall jaw discovery in 1855 (Fig. 12).

the jaw, the wise anatomists of Great Britain, of western Europe, and of the North American continent have expressed opinions of every variety.

The author's peace-loving friend, Smith Woodward,

[1] Charles Dawson and A. S. Woodward: On the Discovery of a Palaeolithic Human Skull and Mandible in a Flint-bearing Gravel overlying the Wealden (Hastings Beds) at Piltdown, Fletching (Sussex). With an Appendix by Prof. G. Elliot Smith. *Quart. Journ. Geol. Soc.*, London, Vol. LXIX, 1913, pp. 117–151, Pls. 15–21. *Ibid.*, Vol. LXX, 1914, pp. 82–99.

started the fracas by giving these fragments the name *Eoanthropus*, signifying 'dawn man,' and thereby committed himself to the idea that here was a new genus of man quite distinct from the existing genus *Homo* and the antipode of the species *Homo sapiens*, the name assigned by Linnaeus to all the living races of man. To the other extreme, Marcellin Boule, the French palaeontologist, resolutely adhered, namely, that the fragments do not represent a Dawn Man at all, that they belong to the same genus *Homo* as ourselves, that the species may be known as *Homo dawsoni*, that the Piltdown Dawn Man is of relatively recent geologic age, namely, of the Third Interglacial period and of the Acheulean culture phase. Moreover, Boule joined a chorus of American and German opinion that the jaw does not belong with the skull, but is that of a chimpanzee, and that the skull itself in brain capacity is that of a relatively recent type. This opinion was reaffirmed by Boule in his great work of 1921, "Les Hommes Fossiles,"[1] in which all the discoveries of fossil human remains were reviewed from beginning to end in the most searching manner, and in which the chronologic succession of the human fossil types is clearly set forth.

Thus the Piltdown Dawn Man has shared a struggle for scientific recognition similar to that of the Neanderthal man of Germany, which was discovered by some workmen in 1856 and described by Schaaffhausen in 1858—especially through the skull-cap, thigh bones, and other skeletal fragments—and received with almost universal scepticism. The Neanderthal man was regarded by Virchow, the high German authority, as a feeble-minded modern and was

[1] Marcellin Boule: Les Hommes Fossiles. Eléments de Paléontologie Humaine, pp. i-xi, 1–491, figs. 1–239.

treated very lightly even by Darwin in his great work, "The Descent of Man," published in 1871, although the geologist Lyell (1863) had recognized the Neanderthal man as an intermediate form between man and the apes.

Even the progressive Huxley (1863, 1864) did not recognize the Neanderthal man as the missing link, his opinion[1] being that "there is no ground for separating its possessor specifically, still less generically, from *Homo sapiens*. At present, we have no sufficient warranty for declaring it to be either the type of a distinct race, or a member of any existing one; nor do the anatomical characters of the skull justify any conclusion as to the age to which it belongs."

When we recall the fact that the 'Gibraltar skull' of a Neanderthal woman had been known since 1848, we may say that the Neanderthal race was under a cloud of suspicion for nearly forty years, that is, until 1887, when the discovery was made of two Neanderthal skeletons and skulls in a grotto near Spy, not far from Dinant, Belgium. It was these Spy relics, which seem to agree exactly with the Neanderthal skull top and with subsequent discoveries in other localities, that firmly established the Neanderthal race as one of the most important, and now by far the best known, of all fossil men.

There has been on the part of anthropologists no conspiracy or hasty acceptance of any of these fossil men. The Neanderthal Stone Age man discovered in 1848, the Trinil 'ape-man' of Java discovered in 1891, the Piltdown Dawn Man discovered in 1911, have had in turn a hard struggle for scientific recognition, lasting thirty-nine years in the case of the Neanderthal man, more than thirty years in the

[1] T. H. Huxley: Further Remarks upon the Human Remains from the Neanderthal Chap. XXXVI, p. 588, of "The Scientific Memoirs of Thomas Henry Huxley."

case of the Trinil 'ape-man' (*fide* Dubois), and no less than ten years in the case of the Dawn Man of Piltdown.

A Triumph of Persistent Research

The history of anthropology does not include any story of persistent exploration, discovery, and research more worthy of recognition and praise than that connected with the Dawn Man of Sussex. Arthur Smith Woodward, who took a very bold step in originally proposing the Piltdown man as belonging to the new genus *Eoanthropus*, has not stopped to reply to any of his critics; he has left this to some of his colleagues, who have replied with considerable warmth, while he himself has been unremittingly engaged in endeavoring to secure material to confirm his original description and estimate of the characters of the Dawn Man.

The locality which the author will now describe from his own visit of July 26, 1921, presents exceptional difficulties, chiefly because the Piltdown gravels are of almost exactly the same color as the fossils which they contain; the fossils are thus extremely inconspicuous. From prolonged experience in fossil hunting during the past fifty years in various parts of the world, the author can truthfully say that he knows of no locality where fossil remains are so indistinguishable from the stony matrix in which they are found. Under these conditions the discovery of the original fragments of the Piltdown skull was all the more creditable; the subsequent finding of the jaw fragment by Charles Dawson marked the turning point in the whole history of the discovery; the finding of the canine or eye tooth by Teilhard de Chardin indicated an almost hawk-like vision; finally, the unearthing of the two minute black-colored nasal bones of the Dawn Man was almost a miracle.

Alongside the roadway leading to the Manor House, where the original find was made, the workings, 150 feet in length and 10 feet in width, have been carried on at intervals for ten years. Every pound of Piltdown gravel has been gone over minutely, or sifted, under Smith Woodward's immediate supervision. Openings were made on the other side of the hedge, revealing the same Piltdown gravel and the same superposed layers as shown in our section (Fig. 19) without the discovery of another fragment of bone. Only during the season of 1921 was there a cut made beneath the adjacent roadway within a short radius of the very spot where the bones of the skull and jaw lay. The rewards of this exhaustive and exhausting work, which throughout required infinite patience and persistence, have been few and far between, but sparse as the new evidence is, it has all been in the direction of gradual confirmation and strengthening of the original Dawson-Smith Woodward discovery—a discovery of transcendent importance to the prehistory of man.

Scepticism as to the association of the chimpanzee-like jaw of the Dawn Man of Piltdown with the skull was very widespread. In the original description Smith Woodward himself proclaimed the resemblance of the jaw to that of a chimpanzee. The present author was one of the American school of sceptics who finally reached the opinion that this was an instance of the accidental association of two wholly unrelated fossils. It would have been difficult to dislodge this sceptical opinion, so widely entertained in Europe and America, but for the overwhelming confirmation afforded to Smith Woodward by the discovery, announced in 1917,[1]

[1] A. S. Woodward: Fourth Note on the Piltdown Gravel with Evidence of a Second Skull of *Eoanthropus dawsoni*. With an Appendix by Prof. G. Elliot Smith. *Quart. Journ. Geol. Soc.*, Vol. LXXIII, 1917, pp. 1–10, Pl. I, Figs. 1, 2.

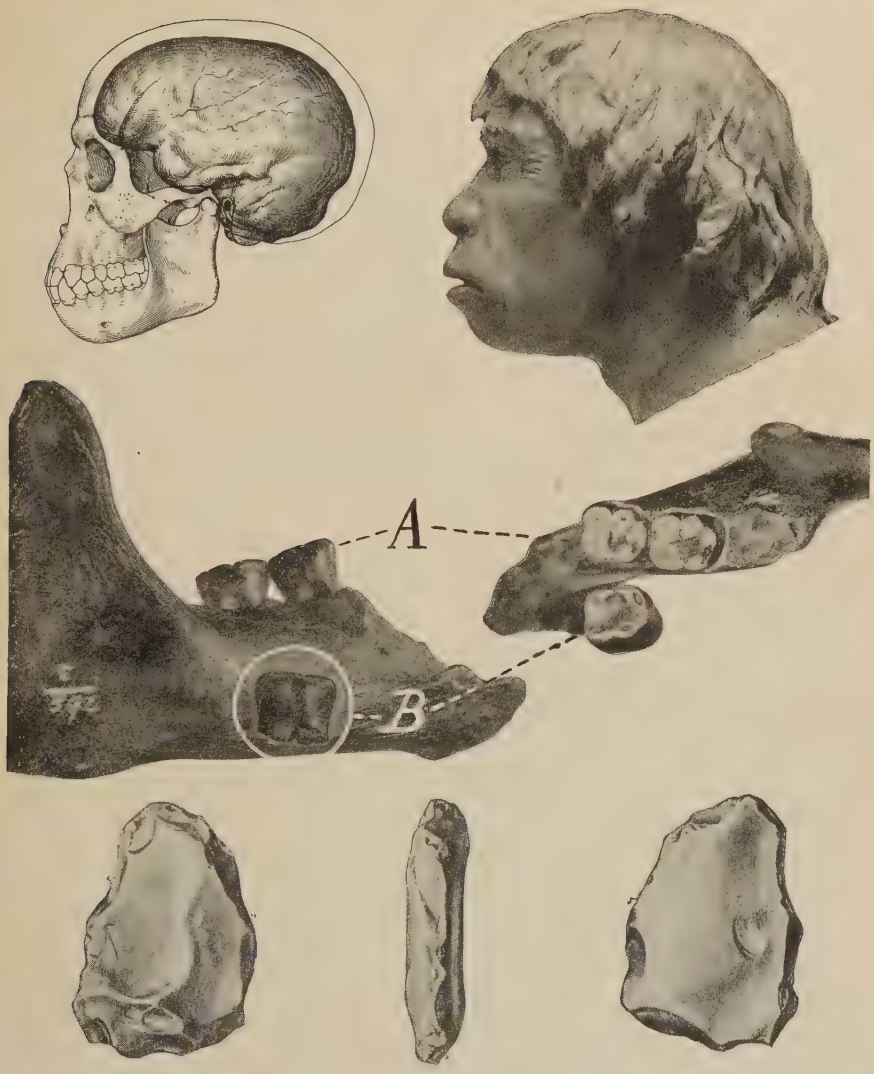


Fig. 17. Relics of the Piltdown Race. *Upper*: Piltdown skull (left) with brain restored to show the extreme thickness of the bony brain case and a well formed brain; (right) profile restoration of the Piltdown head. 1-5 natural size. After McGregor, 1914.

Middle: Side and top views of (A) original jaw, with sloping chin and well worn grinding teeth resembling those of the chimpanzee; of (B) first lower grinder of another Piltdown individual. About 3-4 natural size.

Lower: Primitive worked 'Eolithic' flint found in the same layer with fragments of the Piltdown skull. After Dawson.

Fig. 18. Scene of the World-Famous Discovery of the Piltdown Dawn Man of Sussex. *A*: View of Piltdown Common within a few yards of the pit where the skull of *Eoanthropus dawsoni* was found. *D*: Arthur Smith Woodward (right) and the present author (left) standing on the Piltdown gravel where the skull was unearthed. *Lower*: Arthur Smith Woodward with Charles Dawson (left) screening and washing Piltdown gravel in search of more fragments of the skull and teeth. At the right a workman stands on the exact spot of the original discovery. After J. Leon Williams. 1912.

of the remains of a *second Piltdown Dawn Man*, not in the original quarry but at another exposure of the Piltdown gravels about two miles distant. This second and confirmatory discovery was made by the original finder, Dawson.

If there is a Providence hanging over the affairs of prehistoric men, it certainly manifested itself in this case, because the three minute fragments of this second Piltdown Dawn Man found by Dawson are exactly those which we would have selected to confirm the comparison with the original type, namely: (1) a first lower molar tooth, (2) a bit of bone of the forehead near the right eyebrow, (3) the middle part of an occipital bone of the skull. Both the grinding tooth and the eyebrow region are absolutely distinctive. Placed side by side with the corresponding fossils of the first Piltdown man they agree precisely; there is not a shadow of difference. As shown in the accompanying photograph (Fig. 17, middle) published by permission of Dr. Smith Woodward, the two grinding teeth differ only in respect to age. The first Piltdown man was more advanced in years and the teeth were more worn; the second Piltdown man was younger and the teeth were unworn; but they present precisely the same characters. Smith Woodward very quietly published this confirmatory evidence without, however, alluding in any way to his critics or yielding to the natural temptation of writing, "I told you so," a phrase which would certainly have appeared from a less patient and dignified pen.

Seeing is believing, and in the year 1921, a decade after the discovery, the author eagerly looked forward to a return to the British Museum after so many years of absence and to the opportunity of examining these precious fossil documents, an opportunity which was most cordially ex-

tended to him by Dr. Smith Woodward. On Sunday morning, July 24, after attending a most memorable service in Westminster Abbey, the author repaired to the British Museum to see the fossil remains of the now thoroughly vindicated Dawn Man of Great Britain. The few precious fragments of one of the original Britons, which had been preserved in a steel fireproof safe from the bombs thrown by German aviators and which will probably be thus guarded from thieves for all future time, were taken out

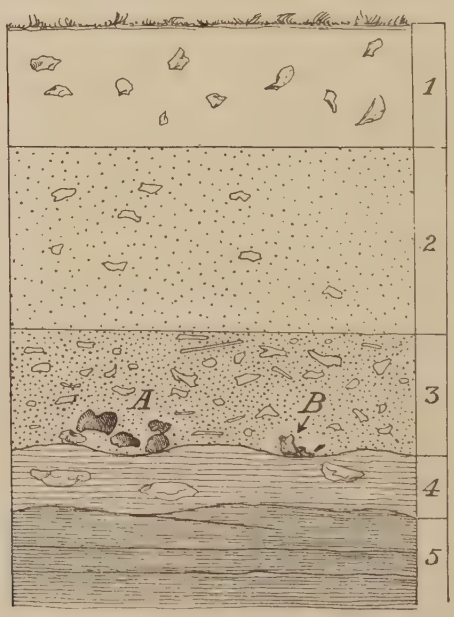


Fig. 19. Section of the Piltdown Gravels, with layers above and below.

1. Recent humus and surface soil, with scattered natural flints, 12-20 inches.
2. Pale yellow sandy loam with gravel and *Neolithic* flints and pottery, 2 feet 6 inches.
3. Piltdown gravel, probably of Pliocene age, containing remains of the *Eoanthropus* skull (A), jaw (B), and teeth from the lower level, also worked flints and rolled water-worn fossils, 18-20 inches.
4. Pale yellow clay and sand with scattered potato-shaped flints unworked. The bone tool implement (Fig. 23) was found at the bottom of this layer, 10 inches.
5. Undisturbed strata of Lower Cretaceous (Wealden age), over the surface of which flowed the stream bearing the clays and Piltdown gravels.

and placed on the table by Smith Woodward, so that full and free opportunity was given for the closest comparison and study.

At the end of two hours of close observation in which worked flints and a large implement of cut *Mastodon* thigh bone were also examined, the author was reminded of an opening prayer of college days, attributed to his professor of logic in Princeton University: "Paradoxical as it may appear, O Lord, it is nevertheless true, etc." So the author felt. Paradoxical as it had appeared to the sceptical comparative anatomists, the chinless Piltdown jaw, shaped exactly like that of a chimpanzee and with its relatively long, narrow teeth, does belong with the Piltdown skull, with its relatively high, well-formed forehead and relatively capacious brain case!

Burial-ground of the Piltdown Dawn Man

The Piltdown Dawn Man belongs to an age long prior to the reverent ceremonial burial of the dead which we find in late Stone Age time among the Neanderthals. At death the Piltdown skeleton was caught in the currents of the ancient River Ouse and drifted downstream, probably dismembered by preying crocodiles and fishes, the skeleton and jaw then becoming buried in the pebbly deposit now known as the Piltdown gravels. Let us therefore look over the ground of the original Piltdown discovery, as the author was privileged to do in company with Dr. Smith Woodward and Dr. H. M. Ami, Canadian geologist, to whom he is indebted for certain of the accompanying photographs.

Like the East Anglia coast region where the flints of the sub-Red Crag and Foxhall Dawn Men were discovered,

beginning in 1909, this Piltdown region is full of historic interest. At the time of the invasion of Caesar's army it was densely forested. This Anderida forest, otherwise known as the forest of 'Andredesweald,' formerly covering the entire Piltdown Commons (or Weald), is thus described by Elton:[1] "The great marshes were still unbanked and open to the flowing of the tide . . . and several hundreds of square miles were covered by the dense forest of Anderida. This forest must at one time have covered most of southeastern Britain."

Many thousand years earlier, flowing through a warm temperate forest, the ancestral River Ouse transported the Piltdown gravels, which, although of very moderate thickness (20 inches to 2 feet) at the widest part, spread out like a fan or river delta beneath the Common over a considerable area; they are instantly recognized by the dark brown, compact sands and pebbles, which are sought by road-makers for their excellent road-building qualities. In approaching the famous site one passes over a rolling open plain covered with patches of heather, now serving as a golf course. On the horizon are the elevated North Down and South Down overlying bluffs of flint-bearing chalk, which, in turn, are superposed on beds of Wealden age, as shown in the accompanying sketch (Fig. 21) made by the author. At Piltdown meandered the ancient River Ouse, and the gravels were subsequently covered with two layers, as shown in the sketch (Fig. 19). It is necessary, however, to take a bird's-eye view of the ground from above in order accurately to locate the very spot where the skull was found and to appreciate the immense amount of work that

[1] Charles Elton: Origins of English History, p. 106.

has been done since 1911 in searching for additional evidence.

For ten years, without any subvention or state aid, Smith Woodward quietly continued his work. He wrote October 24, 1921: "I did a little more digging last month, but without result."

It will be recalled that the working of this Piltdown gravel pit had been going on for many years previous. The successive order of discovery is approximately as follows: 1911 (reported)—Unusually thick human parietal bone

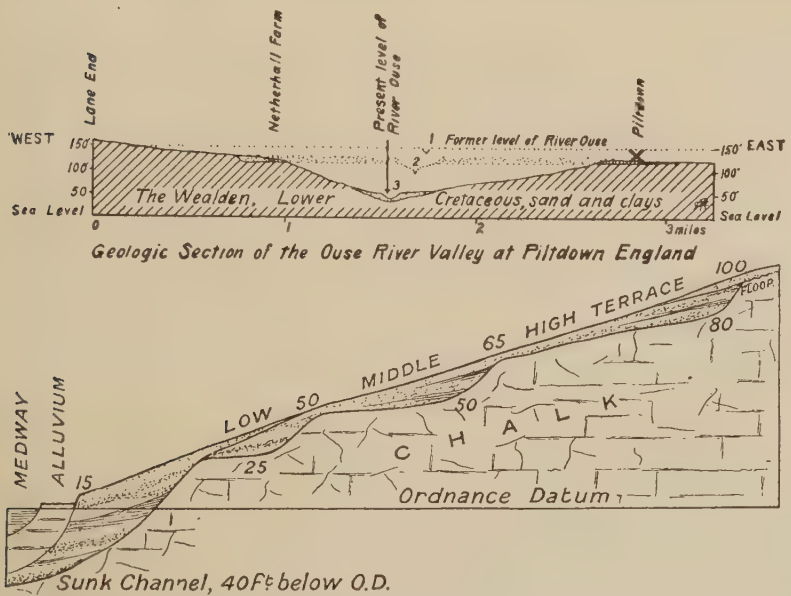


Fig. 20. High Pliocene Level of the Piltdown Gravel. *Upper*: Geologic section of the Ouse River valley at Piltdown, England. The Piltdown gravels (x) were deposited at (1) the former level of the River Ouse, considered of the same geologic age as the high 90-100 foot terrace of the Medway (below). These gravels (x) are regarded by English geologists as of First Interglacial age but by the present author as of Upper Pliocene preglacial age (see Fig. 1).

Lower: Section of the Medway River bank, Frindsbury, showing the high 100-foot terrace, which is regarded by some geologists as of the same geologic age as the Piltdown gravels. Observe that the River Medway, like the present River Ouse, has cut its channel down from the high, middle and low terraces to the 15-foot level which belongs to the period of the fourth glaciation and which contains both in England and France deposits belonging to the very close of the Old Stone Age.

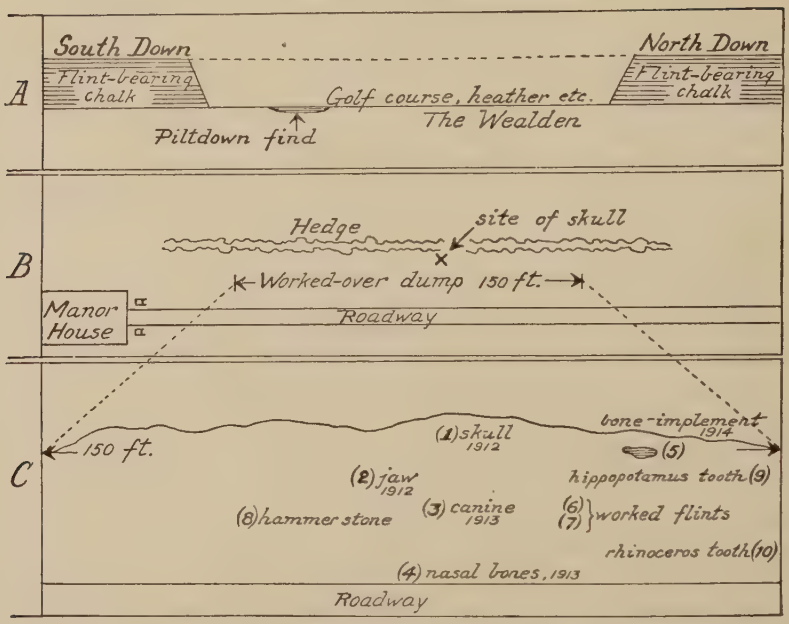


Fig. 21. Sketches by the Author of the Scene of the Fifteen Years' Search by A. Smith Woodward for Fragments of the Skull and Teeth and for Evidence of the Flint and Bone Industry of Eoanthropus Dawsoni. *A*, general relations of the "Downs" to the Piltdown find. *B*, the Piltdown gravel workings from 1912 to 1921. *C*, relative location of some of the principal finds; skull and jaw parts found near together. (1) Skull fragments in the workman's dump, (2) jaw, (3) canine, and (4) nasal bones, picked out of the undisturbed gravel near by, (5)-(10) flints and fossil bones scattered.

was found by Dawson. 1911 (autumn)—Dawson picked up another and larger piece of bone belonging to the forehead region of the same skull and including a portion of the ridge extending over the left eyebrow. 1911–1912—At various times there were found by Dawson and Smith Woodward rolled or abraded flints, known as 'eoliths,' also rolled or abraded remains of the hippopotamus, the rhinoceros, and of a mastodont proboscidean, *claimed to be of greater age* than the Piltdown gravels, possibly of Pliocene Red Crag age. At various times also there were unearthed (1) a Palaeolithic *hammer-stone* (see Fig. 21, No. 8) found in the undisturbed gravel, (2) freshly worked flints, discovered by

Dawson in the Piltdown gravel dump (Fig. 22), and (3) the flint found by Ray Lankester. These flints are extremely important, because they are of the same geologic age as Piltdown man and can be compared with those of Foxhall and of the pre-Chellean of the Somme. 1912—Dawson and Smith Woodward began systematic search. All material was looked over and carefully sifted; it appeared that the whole or greater part of the human skull mentioned above had been scattered by the workmen, who had thrown away the pieces unnoticed. One Sunday evening the blow of a pick caused the right half of a jaw to fly out of the undisturbed bottom of the gravel bed. The fore part of the jaw

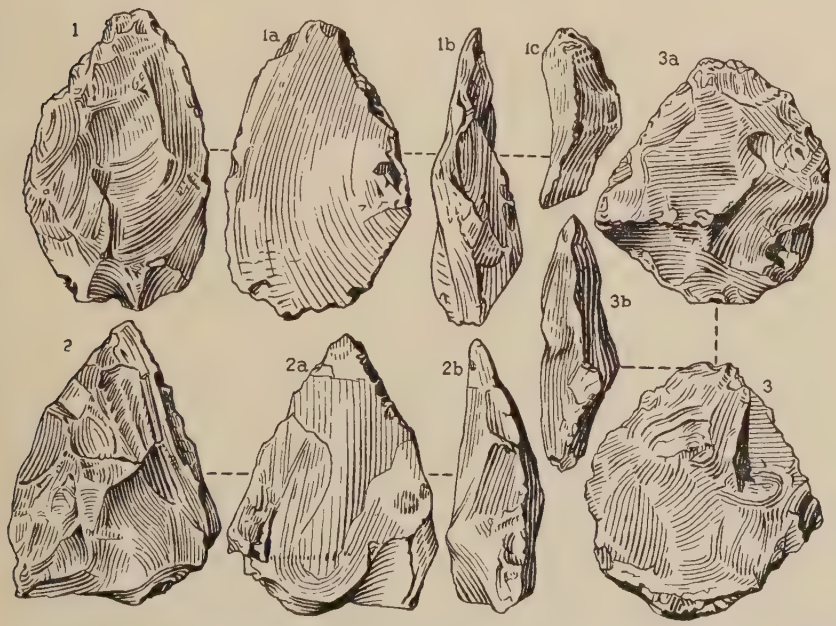


Fig. 22. FLINTS FOUND BY CHARLES DAWSON IN THE PILTDOWN GRAVEL. Three freshly chipped triangular and oval flint tools fashioned out of flint nodules split in two and flaked on one side only with very coarse marginal retouch similar to the flints of the Foxhall quarry. 1-4 - 1-2 natural size. After Dawson.

had apparently been cut off by a long-previous blow of a workman's pick. A yard from the jaw an important piece of the occipital bone of the skull was found. 1913—A single right lower canine tooth, ape-like, was unearthed by Teilhard de Chardin, the French anthropologist. A pair of minute nasal bones were found, also the turbinal bones of the nasal region. 1914—A bone implement, partly shaped at one end out of a mastodon thigh bone, was discovered in the clay layer beneath the gravel. 1915—Discovery by Charles Dawson of fragments of second Piltdown man, two miles distant from original pit. 1915–21—Annual visits and continued exploration, excavations, and sifting of materials, not rewarded by any further discovery, by Smith Woodward.

Reconstruction of the Piltdown Skull and Brain

It is now generally agreed that the author and his colleague McGregor of Columbia University were mistaken in placing in the upper jaw the canine tooth discovered by Teilhard de Chardin in 1913; that the canine tooth belongs with the right lower jaw and in so far is confirmatory of the union of the jaw with the skull. Consequently the photograph (Fig. 23) of the right side of the skull, with the canine in place, represents the latest opinion[1] as to the reconstruction of the skull. This reconstruction involves especially the size and weight of the brain through the determination of the median line of the top of the skull or the location of the so-called sagittal suture.

The brain size of the Piltdown Dawn Man is one of the

[1] A recent comparison of the single canine tooth has convinced Gregory, Hellman, and the author that it most nearly resembles the *right lower canine* of a female gorilla of relatively small size. It is very unlike a *human canine* in form and proportion. The doctors still disagree, for McGregor, another expert, feels strongly (December 15, 1921) that the identification of the Piltdown canine is a very uncertain matter.

points about which has raged the greatest controversy. It is interesting now to recall that in 1913 Smith Woodward first estimated the brain size as 1070 cubic centimeters. Arthur Keith, the distinguished comparative anatomist, maintained that when the skull was properly reconstructed the brain capacity would be found to equal 1500 cubic centimeters. Elliot Smith and Smith Woodward later maintained that the brain measured nearly 1300 cubic centimeters, equaling the size of the smaller human brains of today and surpassing that of the Australians, which rarely exceeds 1310 cubic centimeters in the male and 1154 cubic centimeters in the female. In 1914 J. H. McGregor reconstructed the skull with a cranial capacity of 1240 cubic

BRAIN TEST IN CUBIC CENTIMETERS OF LIVING AND FOSSIL RACES OF MAN

(Fossil races in italics)

	CUBE OF BRAIN CAPACITY		
	MALE	FEMALE	MAXIMUM
Neanderthal Cavemen of Western Europe:			
La Chapelle aux Saints	1530	.....	.....
La Quina, France	.....	1367	.....
Gibraltar, Spain	.....	1250–1300	.....
Cro-Magnon Caveman of Mentone	1550	.....	1590
Average Modern European	1450	1300	.....
Average Modern Swiss	1467	1349	1660
Upper Palaeolithic broadhead race of Ofnet	1400	.....	.....
Living broadhead race of Czechoslovakia	1415	1266	1800
Native Australian race	1310	1154	.....
Native Indian Veddahs	1250	1139	1400
Piltdown Dawn Man of Sussex, England	1240	.....	.....
Papuans of New Guinea	1236	1125	.....
Trinil Dawn Man of Java (Pithecanthropus erectus)	940	.....	.....

By the cubic brain intelligence test the Neanderthal (1530 ccm.) and the Cro-Magnon (1550 ccm.) fossil races rank above the average modern Swiss (1467 ccm.), Czechoslovakian (1415 ccm.), Native Australian (1310 ccm.) and Papuan (1236 ccm.), although the fossil man failed to reach the living man in maximum brain size.

The Trinil (940 ccm.) and Piltdown (1240 ccm.) races, at the very close of the Age of Mammals, are of brain capacity nearly equal to the living Indian Veddahs (1250 ccm.).

(H. L. Shapiro, 1927)

TABLE IV

centimeters, a figure quite near that arrived at by Elliot Smith and Smith Woodward.

Although we still await a memoir on the characters of the Piltdown brain by G. Elliot Smith, the greatest British authority on the primitive brain of man, it is not probable that the final estimates of the brain weight will be materially altered, nor may we expect in the near future any great additions to our knowledge of either the skull or the teeth of the Dawn Man. Inasmuch as a century of exploration in what may be called the pre-burial period of man has yielded the remains of only five individual specimens nearly or remotely related to man, the probability of finding additional fossils is rather remote. This greatly intensifies the interest of the important discovery of the Foxhall man and renders the more pressing the location of the lost jaw which is attributed to the Foxhallian stage of industry.

Is the Piltdown Flint Industry Related to That of Foxhall?

Piltdown Common, on the River Ouse, is about 230 miles northwest of the famous Chellean flint quarry stations of the ancient Somme and Marne rivers of France and not many miles south of the flint quarry of Gray's Thurrock on the Thames. To the north of Piltdown, in ancient East Anglia, were the stations of the Foxhallian and Cromerian industries, described above, and the site of the discovery of the alleged Foxhall jaw. It is, therefore, altogether natural from the geologic standpoint to compare the three or four true flints which have been found with the Piltdown man with those of the earliest Chellean station on the Somme and of the *Champ de Mars* near Abbeville

described by d'Ault du Mesnil, and with those of Foxhall, to the north, recently described by J. Reid Moir.[1]

The first archaeologist to make the suggestion that the flint implements and weapons of Piltdown, Sussex, are similar to those of Foxhall, Suffolk, was J. Reid Moir in his extremely interesting memoir, "Pre-Palaeolithic Man," published in 1920,[2] wherein he remarks: "If the author, as a practical flaker of flint, had been shown Dr. Smith Woodward's reconstruction of the Piltdown skull and jaw, and had been asked what sort of flint implements in his opinion such a very primitive semi-human creature would be capable of producing, his answer would have been 'the very primitive edge-trimmed flints generally known as eoliths.' . . . The ill-defined cones of percussion, and rough, heavily-truncated flake-scars of the Piltdown specimens stamp them indelibly as the work of pre-palaeolithic man. . . . The only implements found in the 'human' stratum and in intimate association with the Piltdown individual were the primitive edge-trimmed flints generally described as eoliths. . . . This particular type of implement represents, as has been shown in a former chapter, the earliest efforts of man to deliberately shape flints to his needs."

Reid Moir further pointed out that there would not appear to be any valid geological reason why the lower stratum of the gravel at Piltdown should not be a Pliocene deposit overlain by gravelly strata of more recent date, inasmuch as the Piltdown bones were found at about 120 feet above the present sea level and approximately 80 feet above the present level of the River Ouse, Sussex (Fig. 20).

[1] J. Reid Moir: Further Discoveries of Humanly-Fashioned Flints In and Beneath the Red Crag of Suffolk. *Prehist. Soc. East Anglia*, 1920–1921, pp. 1–42.

[2] J. Reid Moir: Pre-Palaeolithic Man, pp. 1–67, Pls. I–XXIX.

To test this significant statement as to *similarity of workmanship in the Piltdown and Foxhall flints*, let us place side by side the published figures of the four flints actually found in the Piltdown gravels which hitherto have been broadly described as of pre-Chellean (that is, earliest Chellean) type, and four flints selected from those recently figured by Moir in his Foxhall collection, and see how they compare in the state of workmanship which they represent. In the author's opinion, which is not that of a professional archaeologist, the resemblance is very close indeed. It will be observed, even by the amateur, that both the Piltdown and the Foxhall flint implements are (1) fashioned from large flakes struck off from the side of the flint nodule, (2) that the outer or convex side of the flake is roughly worked with a varying number of blows, and (3) that there are a few solid core implements.

The fivefold purpose of the industry in the Piltdown and Foxhall mind seems to have been (as shown in a foregoing paragraph): First, to fashion pointed flake implements which could be fastened to wood and used in the chase—for example, rough spearheads (Fig. 15, Nos. 12, 19); second, somewhat larger pointed core implements, which could be used in the chase or in combat—crude anticipations of the *coup de poing* (Fig. 15, Nos. 13, 45); third, flaked implements dressed on one side, with cutting edges, which could be used in shaping bone or wood; fourth, oval convex implements suggesting the rostro-carinate as well as *grattoirs*, flat on one side, which could be used in the dressing of hides for clothing (Fig. 15, No. 17); fifth, a borer (Fig. 15, No. 21) for use in making holes in wood or bone. Hammer-stones used in the flint-flaking industry have been found at Piltdown only. All five of these types

have been found at Foxhall, but only *three* in Piltdown, namely, the rough spearhead, the hide-dresser, and the hammer-stone. The *coup de poing* or 'hand stone' of pre-Chellean and Chellean times, fashioned from the flint nodule core itself, is foreshadowed in the Foxhall cores (Fig. 15). Thus Moir's contention that the Foxhall Pliocene industry is prophetic of the Pleistocene industry of much more recent Chellean times appears to be well sustained. It follows that the identification of the Piltdown flints with the Foxhall flints, if it can be made by placing the implements side by side, may enable us to settle one of the remaining points of doubt about the Dawn Man, that is, his geologic antiquity.

Reid Moir's praise of the workmanship of the Dawn Man flint workers of Foxhall is qualified, but how shall we *explain* this workmanship of a high order in Upper Pliocene time so long before the primitive Chellean flint industry of the River Somme at the height of the Old Stone Age, in what is known as Lower Palaeolithic time? It appears to the author that we can explain it only by reforming our ideas of the antiquity of man and by preparing our minds for the future discovery of still more ancient man in Tertiary time and for evidence of a very early separation of human races and industries. Great discoveries in the rise of man have been made which revolutionize all our earlier ideas of human antiquity and intelligence, and we must keep our minds open for still more remarkable discoveries.

Anatomists now agree that *Eoanthropus* is of a very ancient type, altogether such as we should expect to find at the very beginning of the Quaternary Age of Man or even in the Pliocene Age of Mammals. The present author came to the following conclusion in 1914: "It seems rea-

sonable, therefore, to interpret the Piltdown skull as exhibiting a closer resemblance to the skulls of our human ancestors in mid-Tertiary times than any fossil skull hitherto found."[1]

The author not only recants his former doubts as to the association of the jaw with the skull, but expresses his admiration of the great achievement of his life-long friend, Arthur Smith Woodward, in making the original discovery and in finally establishing beyond question the authenticity of the Dawn Man of Piltdown. The confirmation of the reality of the Piltdown man as a veritable 'dawn man' must be followed by renewed and determined effort to fix more precisely his *geologic antiquity*, about which there has also been a great difference of opinion and on which the discovery of Foxhall man, described above, may have some bearing.

We have to be reminded over and over again that Nature is full of paradoxes and that the order of the universe is not the human order; we should always expect the unexpected and be prepared to discover new paradoxes.

II. BEGINNING OF THE OLD STONE AGE[2]

We pass now from the Pliocene Dawn Stone Age into the Pleistocene Old Stone Age. After the rostro-carinate flint workers of Bramford, after the flint workers of Foxhall and of Piltdown, came the prolonged cold of the First Glaciation, which ushered in the true Age of Man. Whether the same races of Dawn Men persisted or not, we enter a new industrial flint making phase, as displayed near Cromer on the upper coast of East Anglia in J. Reid Moir's discovery of giant flints (Fig. 24).

[1] Osborn: Men of the Old Stone Age, p. 25.
[2] Compare I. The Dawn Stone Age, p. 25.

Fig. 23. Worked Bone and Flint Tools Found near the Piltdown Skull. *Left*: Partly shaped tool cut from the thigh bone of a mastodon or mammoth, possibly used for hide dressing. 1-12 natural size. After Smith Woodward.

Upper right: Most recent restoration of the Piltdown skull by Smith Woodward, in which the nasal bones appear in place and the canine is inserted in the right half of the lower jaw. 1-5 natural size. *Lower right*: Rolled flints, or 'eoliths'; *perçoir* or borer above, *râcloir* or scraper below.

Fig. 24. Giant Coup de Poing or Hand Axe of Cromer, Norfolk. 1-3 actual size. After J. Reid Moir, 1921. Compare with relatively small Chellean *coup de poing* (Fig. 25), which is drawn to same scale.

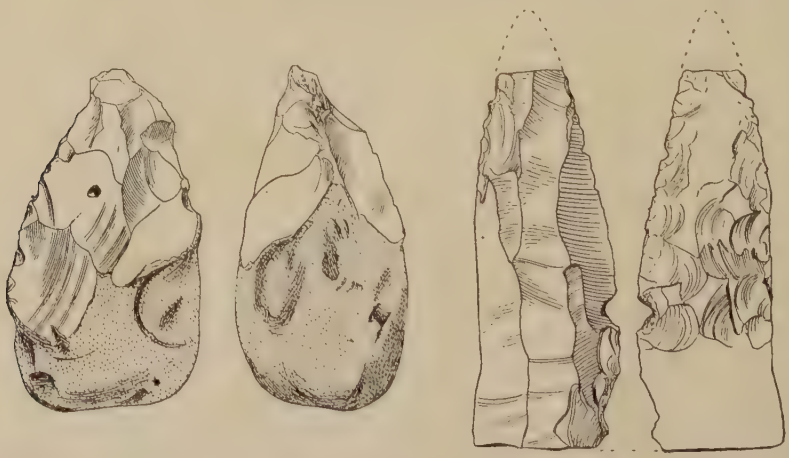


Fig. 25. Flint Implements from Kent's Cavern, Devonshire. *Left* (2): *Coup de poing* or hand axe of Chellean form. 1-3 natural size. *Right* (2): Spearhead of primitive Solutrean form. 2-3 natural size. After Reginald A. Smith.

The Giant Flints of Cromer, Norfolk

Much openness of mind is rendered necessary by Moir's discovery of the *giant flints of Cromer*, products of an industry of very different character from those of Foxhall, of more recent geologic age and possibly the work of a different race. The Cliffs of Cromer (Figs. 14, 26) are situated on the sinking coast of Great Britain. At one end of the Cliffs, along the fashionable bathing beach which is exposed only at low tide, Reid Moir discovered huge flints which had been washed out of the fossil deposits of that section. These flints occur in one of the most famous mammal deposits in the world, long known to palaeontologists as the 'Forest Bed of Cromer.' Because of their resemblance to flints of Chellean type, their discoverer regards them as pre-Chellean or early Chellean, but the author is inclined to assign them a much earlier date, because they are in the same level as the Forest Bed, the deposits of which, with their fauna, belong to the very beginning of the Age of Man. As yet no archaeologist has found any traces of Chellean industry in formations belonging to the First Interglacial stage of Europe, while all the geologic and palaeontologic evidence seems to indicate that to this very stage belong the giant flints of Cromer.

Thus it appears that in this discovery by Reid Moir of the giant flints of Cromer we enter a new era in the prehistory of man, for two reasons: First, geologically the first invasion of Swiss and Scandinavian glaciers has passed by and we have entered the long warm First Interglacial period, to which is attributed the fossil remains of the Heidelberg race of Neanderthaloids discovered by Schoetensack along the ancient Elsenz south of the mouth of the

Neckar. Consequently, it appears probable that the 'sands of Mauer' and the famous 'forest-bed of Cromer' were nearly contemporaneous, and it appears *possible* that it was the giant men of the Heidelberg race who fashioned the giant flints of Cromer which we find at low tide at the fashionable bathing place of Cromer, Norfolk, fifty miles east of Foxhall.

The rich mammalian life of the Forest Bed of Cromer is more recent than that of the Red Crag of Suffolk; the short-jawed mastodons (*M. arvernensis*) and other South Temperate forms are extinct; the two great elephants of Lower Pleistocene time—the 'southern' and the 'straight-tusked'—have arrived in East Anglia; the Etruscan rhinoceros lingers. All these fossil animals also occur in France as companions of Stone Age man. It was perhaps to hunt these monsters that the Cromer flint workers developed a giant flint industry, of which 'floors' are discovered at Cromer and at Sheringham five miles to the northeast.

These flints were first mentioned[1] by Sir Ray Lankester, the veteran zoologist of Darwin's time, who has given the strongest backing to Reid Moir's excavations and researches, culminating in his advocacy of the human origin of the Forest Bed giant flint implements, of which he writes:[2] "The second is the most remarkable among a great number of very large worked flints, recently discovered by Mr. Reid Moir below the forest-bed at Cromer in such a position as to indicate a workshop or flint workers' 'floor' —of an age anterior to that of our river-terrace gravels. . . . The largest of the worked flints from this newly-dis-

[1] E. Ray Lankester: On the Discovery of a Novel Type of Flint Implement Below the Base of the Red Crag of Suffolk. *Phil. Trans.*, B, April, 1912. Vol. 202, p. 332.

[2] F. Ray Lankester: A Remarkable Flint Implement from Selsey Bill, *Proc. Roy. Soc.*, B, Vol. 92, 1921, pp. 162–168, Pls. VIII–XI.

covered 'floor' weighs 7 lb. 6 oz., is 10 inches in length, 5½ inches broad and at the 'butt' end is 4 inches thick. It has a rostrate form, a relatively flattened ventral surface and is richly worked all over by large coarse flaking of indubitable human origin. It presents a marked resemblance—both in general form and in the character of the flaking of its surface—to the Selsey rostrate as well as in its great size and weight. The point to which I wish to draw attention in regard to these three unusually large and heavy flint implements, is that they belong to a very early period, antecedent to that of the familiar tongue-shaped and ovate implements of Chellean and Acheulean age. . . . The early age of these big implements is consistent with the hypothesis that they were made and used by an early race of men of heavier build than that which succeeded them and produced the abundant ovates and tongue-shaped implements of our terrace gravels. Whether made by an exceptionally big race or by men of the modern size, the use of heavy big flint implements, such as the two which I have here cited, presents a problem. If used merely as hammers or as club-heads they would be unwieldly and would not require any special shaping—such as would give precision to a smaller implement. The only suggestion I can offer as to their use besides that of 'pounding' or breaking into the cavities of the bones of large animals in order to extract marrow, brain, etc., is that they were employed either affixed to a handle or held by the two hands for the purpose of breaking a hole in the ice on the surface of a lake or marsh pool. Fish come to such openings in the ice and are then readily speared or captured."

While visiting at Cromer in the summer of 1920 and again in the summer of 1926, the author examined these

flints, which have been collected in very large numbers and unfortunately are being somewhat scattered among amateur collectors. This supposed sub-Forest Bed 'floor' should be guarded by the English as a *national monument*, because if the human origin of these flints is incontestably proved, the 'floor' will at once become one of the *most famous spots in the early history of Great Britain*. Only the most expert archaeologist and student of flint mechanics and lines of fracture is competent to express an opinion.

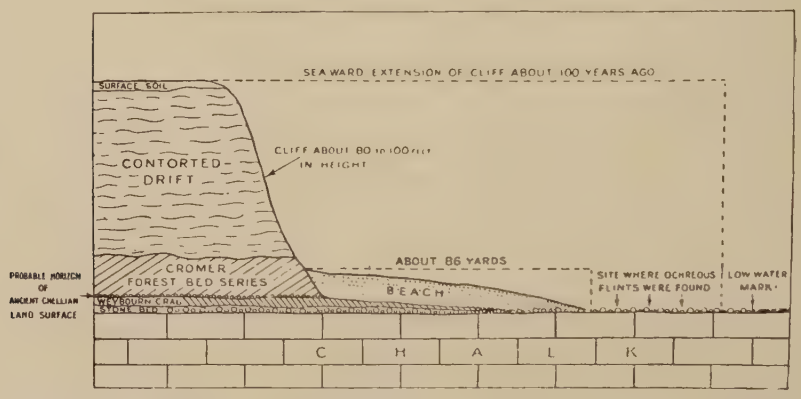

SEAWARD EXTENSION OF CLIFF ABOUT 100 YEARS AGO
SURFACE SOIL
CONTORTED DRIFT
CLIFF ABOUT 80 TO 100 FEET IN HEIGHT
ABOUT 86 YARDS
CROMER FOREST BED SERIES
BEACH
PROBABLE HORIZON OF ANCIENT CHELLIAN LAND SURFACE
WEYBOURN CRAG
SITE WHERE OCHREOUS FLINTS WERE FOUND
LOW WATER MARK
C H A L K

Fig. 26. Geologic Strata of Cliffs of Cromer, showing site of discovery of the giant flints (see Fig. 14). Surface soil at top; contorted drift of the second and third glaciations, which alone reached the coast of England; Cromer Forest Bed series of First Interglacial, full of fossil mammals remains; Weybourn Crag containing cold molluscan fauna of the First Glacial period. Compare with Figs. 1, 2, 14.

The Cromerian 'giant flints' listed in the time scale chart (Fig. 1, p. 24) were possibly fashioned by pioneer members of the great low-browed Neanderthal race which dominated Europe for many hundred thousand years. These people are so much more primitive than any existing race of the genus *Homo* that by some anthropologists they are given the distinctive generic name *Palaeanthropus*, signifying 'man of a very ancient type.' Racial similarity is

indicated by the general similarity between the flint implements of war and the chase, which are successively known as Cromerian, pre-Chellean, Chellean, Acheulean and Mousterian. Excepting the single massive fossil jaw found at Heidelberg and believed to be contemporaneous with the flints of Cromer, no trace of these Neanderthals is found until we reach the far more recent deposits of Ehringsdorf and of Krapina. At this point the long open-weather and open-settlement period, when man wandered on the plains and plateaus and river drifts and fashioned his flints on the higher middle river terraces, finally terminated, and the intensely cold weather of the final glaciation inaugurated the cave period (Fig. 1, p. 24).

Soon after the beginning of the cave period the custom of reverent burial of the dead began, and we gain our first knowledge of the complete characters of the Neanderthal race from upwards of fifty more or less well preserved individuals. At the time, this race was contending with the very severe weather conditions of the Fourth Glaciation; it was driven into shelters and caverns and it is possible that cave life engendered the beginnings of mystical life and belief in a future existence or of a 'happy hunting ground' in a future world.

Pithecanthropus Erectus, a Surviving Dawn Man

Thirty-six years ago, long before the discovery of the Bramford, Foxhall and Piltdown races of man in East Anglia, world-wide interest was aroused by the discovery in Java of an exceedingly primitive human type. After heated scientific discussion and the most careful researches, we have finally determined that this primitive type lived during the Quaternary or Age of Man period; that it prob-

ably represents a condition of arrested mental development, but that it truly belongs to the family of man and not to the ape family—in other words, that it is a Dawn Man rather than an ape-man. This subject has been so fully treated in an earlier work, "Men of the Old Stone Age," that we may here dwell only on the newly discovered characters of the brain and the bearing of brain form and capacity on the relationship to our own race. However, a brief résumé of the history of the discovery may be interesting:

In the year 1891 Dr. Eugèn Dubois, a Dutch army surgeon, found near Trinil, Java, two molar teeth, the top of a skull and a left thigh bone, which in the year 1894 he described under the name *Pithecanthropus erectus*, signifying 'erect Stone Age man.' He attributed to this fossil

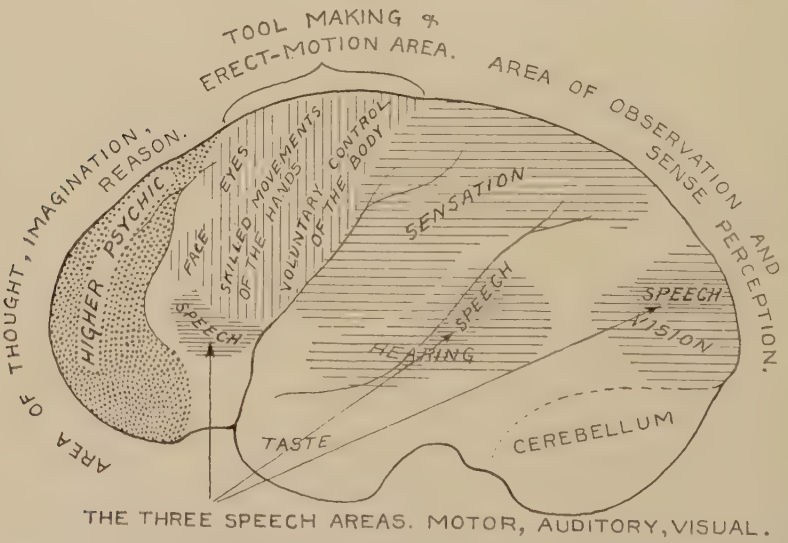


Fig. 27. Brain of the Trinil Dawn Man, *Pithecanthropus erectus* (940 ccm.). Probable areas of higher and lower psychic powers, of voluntary movements and of speech are plotted from the researches of Frederick Tilney and the intracranial model by J. H. McGregor from the cast presented by Dr. Eugèn Dubois. Same scale as Fig. 28.

creature the same upright posture as man, indicated in the specific term *erectus*, combined with the low-browed skull with projecting eyebrow ridges of the anthropoid apes, such as the chimpanzee. This great discovery by Dubois aroused widespread interest, and heated discussion ensued in which the foremost anatomists of the world took part. Only recently has it been possible to intensively study the brain cast yielded by a mold taken on the inside of the bony skull-cap. In general, the result of this study of the brain and of the thigh bone confirms the original opinion of Dubois that *Pithecanthropus erectus* possessed the straight femur of a bipedal walking type and not of a tree-climbing type—thus corroborating the specific appellation *erectus*; that the brain is far larger than that of any kind of anthro-

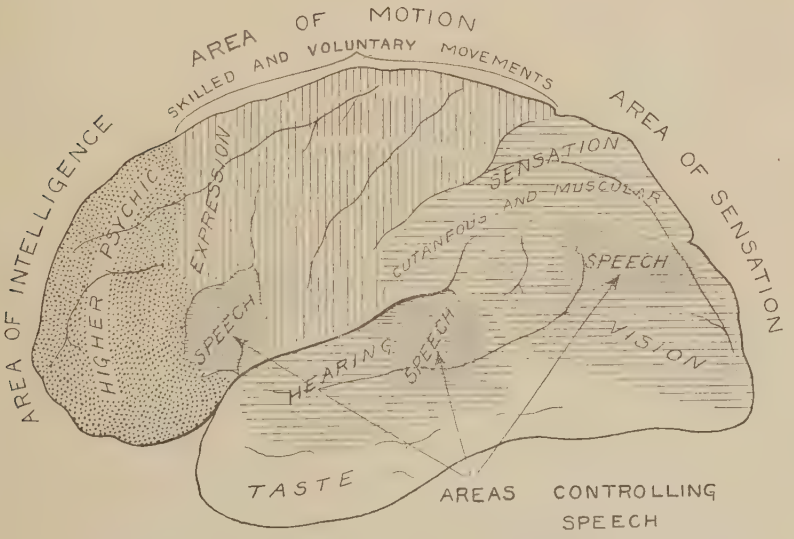


Fig. 28. Brain of the Living Australian (1310 ccm.), showing areas of intelligence (dotted), of skilled and voluntary movements (vertical lines), of sensation (horizontal lines), of speech (close horizontal lines). After Osborn. Compare with Fig. 17, *Eoanthropus*, and Fig. 27, *Pithecanthropus*. Same scale as Fig. 27.

poid ape, and that the skull possesses distinct resemblances to that of the Neanderthal race of men; in brief, that *Pithecanthropus* is related, even if indirectly, to one of the great lines which gave rise to the true human species.

The degree of brain-power intelligence of the Trinil man is therefore of the utmost concern: Is his brain-power of the same kind, perhaps a little better, than that of an ape, a chimpanzee or a gorilla, or is it far superior to that of an ape and similar to that of a lowly order of man?

We have recently found the answer. Since Dr. Eugèn Dubois released to the research of the world the precious fragments discovered by him in the year 1891, Dr. Frederick Tilney has been studying the psychology of the Trinil man through the evidence revealed in a cast of the brain made under the direction of Professor J. Howard McGregor, which demonstrates beyond a doubt that the scientific name *Pithecanthropus* applied by Dubois is a misnomer, that the so-called *Pithecanthropus* was not an 'ape-man,' as the Greek word implies, but a true 'pro-man' or 'dawn man.'

The crucial point in this demonstration is the application of modern intelligence tests to the Trinil man of Java through the expert observations of my Columbia colleagues, Professor J. Howard McGregor, anatomist, and Professor Frederick Tilney, psychiatrist. [See Table IV, p. 67.] The Trinil man of Java proves in his brain to be a Dawn Man and not an ape-man. He certainly had long, strong legs and probably short arms. He walked erect, he thought as man, he probably spoke as man, although his vocabulary was limited.

Geologic Age of the Trinil Dawn Man

In his original description of the Trinil race, in the year 1894, Dr. Dubois believed that this race might belong to the close of the Age of Mammals, namely, to the closing stage of Pliocene time, the geologic period to which we assign the sub-Red Crag man, the Foxhall man and perhaps the Piltdown Dawn Man. But very recent investigation by Professor Dietrich of Berlin and by the present author on the fossil animal remains of the Kendeng beds of the Trinil River, where the skull and thighbone of *Pithecanthropus erectus* were found, proves that the Trinil 'ape-man' is of more recent geologic age; it appears to actually belong in the middle of the Stone Age, corresponding to the age of the typical Chellean flint industry of the River Somme in France, where the remains of the flint workers are found associated with those of the hippopotamus and the straight-tusked elephant. If *Pithecanthropus* is truly of mid-Stone Age, as now appears, it must be regarded as a *surviving* primitive type of Dawn Man sequestered in the forests of Java amid primitive elephants known as stegodonts. This survival of a primitive type of man shut off from competition with more vigorous types is by no means a unique occurrence, because we still find many very primitive types of humanity living in remote and isolated parts of the earth, such as the Tasmanian natives.

Among the contemporaries of the Trinil Dawn Man were the man-apes or anthropoids of southern Asia—the orangs and gibbons—with long arms and short legs, who lived chiefly in trees, who uttered the guttural sounds of apes, who thought with ape-minds, and who, despite worthy family virtues as husbands and wives, were infinitely

inferior to their Trinil man companions. In these anthropoid apes was the potency of the super-apes living today—the orang, chimpanzee, gorilla and gibbon—but in the Trinil man was the potency of modern civilization.

Conclusions as to Our Dawn Man Ancestors

Let us befriend the Dawn Man of the long pre-Stone Age and remove from his reputation the bar sinister of ape descent. The myth of our ape-ancestry lingers on the stage, in the movies, in certain anti-naturalistic literature, in caricatures of our pedigree, even in certain scientific parlance, but the ape-ancestry hypothesis is becoming out of date and its place is being taken by the recent demonstration that we are descended from Dawn Men, not from 'ape-men.'

Accordingly, our closing purposes in this lecture are fourfold: First, to banish the myth and bogie of ape-man ancestry; second, to show that the Dawn Man of Tertiary time had surprisingly great brain-power; third, to point out that we must expand even recent scientific opinions regarding the geologic antiquity of man and project our Dawn Man ancestors back to geologic periods perhaps ten times older than any of our previous estimates up to the close of the nineteenth century; fourth, to demonstrate that the goal of twentieth century discovery is the habit of life and the kind of environment which produced the superior intelligence of the Dawn Man and raised him, even at that very remote period, above the rest of creation.

III

MAN OF THE CAVE PERIOD
SCULPTOR, ENGRAVER, PAINTER

. . . . . .

For, soothly, having eyes to see they saw not,
And hearing heard not; but like dreamy phantoms,
A random life they led from year to year,
All blindly floundering on.
. . . No craft they knew
With woven brick or jointed beam to pile
The sunward porch; but in the dark earth burrowed
And housed, like tiny ants in sunless caves.

—*Aeschylus: Prometheus Bound.*

MAN OF THE CAVE PERIOD
SCULPTOR, ENGRAVER, PAINTER

The Neanderthals the first cave dwellers — Influence of cave life on imagination — The birth of sculpture in southern France — Discoveries in the Caverne Tuc d'Audoubert — Discovery of the etchings in the Caverne des Trois Frères — The human and equine sculptures of Laussel and Cap Blanc

THE cave period is long subsequent to the East Anglian Dawn Man period—hundreds of thousands of years as measured by four successive glaciations in Europe. The Neanderthaloid races—Heidelberg, Krapina, Ehringsdorf and Neanderthal—occupied Europe for an incalculable period of time, namely, from the beginning of the Age of Man to the climax of the fourth and final glaciation, the art age of the cave period.

Of these great, powerful, low-browed Neanderthal races, the first comers were the Heidelberg men, to whom the term *Homo heidelbergensis* has been applied. Since these men appeared in the first warm interglacial period, they were not improbably contemporaneous with the East Anglian flint workers of Cromer who fashioned the gigantic flints found on the northern seashores of East Anglia. Thus far no trace of any human race has been found in western Europe except these low-browed Neanderthaloids. Since human skulls of similar low-browed form have been found in Africa (Rhodesia) and Palestine (Galilee), and since flints resembling those of Neanderthal 'Mousterian' make penetrated even into the Ordos region of north China, it appears not improbable that the Neanderthal

race dominated large parts of Asia and Africa as well as all of western Europe; in Europe they formed a dense population and are thoroughly known in their physical and intellectual structure and in the gradual development of their flint implements, from the giant flints of Cromer to the relatively small and degenerate flints found in the caverns of La Quina, southern France, with what is believed to be one of the last representatives of the great Neanderthal race.

The survival of a single racial type of mankind for a period now estimated at not less than 900,000 years should not surprise us when we contemplate the survival of an

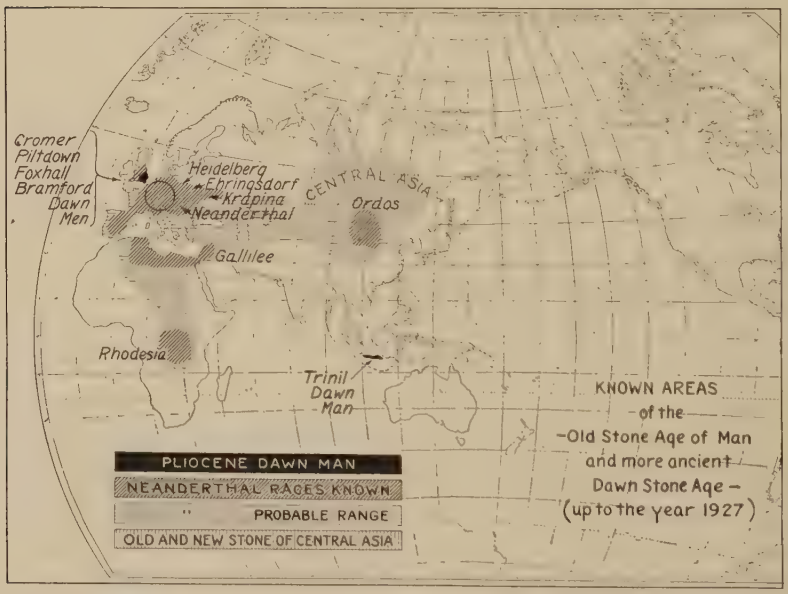


Fig. 29. THE NEANDERTHAL EMPIRE OF THE OLD STONE AGE. In solid black: distribution area of the Dawn Men of Bramford, Foxhall, Piltdown and Trinil, of Pliocene and Pleistocene geologic periods. Oblique lines: known or actual distribution of the Neanderthaloid races of Heidelberg, Ehringsdorf, Krapina, Neanderthal, Galilee, Ordos, and Rhodesia. Horizontal lines: theoretic migration areas of the Neanderthaloid races. Vertical lines: part of the theoretic area of origin of the higher Cro-Magnon and other races which migrated eastward and dispossessed the Neanderthaloid low-browed races.

equally primitive Stone Age race—the native Tasmanians —up to recent time.

As shown in the geologic time scale (Fig. 1), the Neanderthaloids entered western Europe long before the Cave Period; they occupied the plains, plateaus and river drifts of Austria and Germany, Spain and France, and England. The remains of their stone industries and flint-making camps are found in the great river drift deposit near Heidelberg, in the ancient river drifts of Cromer on the East Anglia coast, and on the higher and middle river terraces of France and England. This nomadic life on the plains, plateaus and terraces lasted perhaps for 600,000 years, if we can trust the glacial records. Then at the onset of the third great glaciation from Scandinavia began the Cave Period (indicated in black in Fig. 1). From this time onward to the period of their downfall, the Neanderthaloids were cave dwellers, at least for the colder seasons of the year, while during the warm summer seasons they doubtless wandered forth into their old hunting grounds along the shores of the rivers and worked their flints along the river terraces of northern France and eastern England.

The Neanderthals the First Cave Dwellers

The Neanderthals present a unique instance of arrested and perhaps partly retrogressive human development. Game was very plentiful, the rivers of France and England abounded in hippopotami which afforded an easy source of food supply, and in the forests and plains roamed many types of elephants and rhinoceroses. These easy conditions of life continued until near the close of the reign of the Neanderthal race, with intervals of arid climate and of colder and moister climates during the second and third

glaciations from Scandinavia. The conditions of life did not become very severe until the approach of the intensely cold weather of the fourth or final glaciation, when the Neanderthals were driven from their easy-going existence on the plains, plateaus and river terraces to the rocky shelters and cavern entrances which protected them from the oncoming blasts of the great Scandinavian glacier.

Even these difficult conditions of life did not appear to stimulate new inventions in their flint implements, although it may have aroused their imagination, because at this time they began to reverently bury their dead, usually in front of the rocky shelters or within the entrances of the caverns. *It is to this practice of burial that we owe our first complete knowledge of the physical structure of ancient man.* From these fossil remains we now know the bony anatomy of the Neanderthal race even better than we know the bony anatomy of certain recently extinct or existing races like the Tasmanians. From the anatomy, and especially from our complete knowledge of the brain size, weight and form, we can picture the complete Neanderthal man and contrast him with the highly superior race of man called the 'Cro-Magnon' and with related races which still survive in Europe.

Influence of Cave Life on Imagination

The open-air nomadic life of the plains, river valleys and terraces which preceded the Cave Period developed the physical, moral and inventive faculties of man but was not favorable to the development of the imagination or the spiritual side of Stone Age life. We cannot avoid the conclusion that the cave dwelling period of which we find traces in the entire northern hemisphere was of incalcu-

Fig. 30. NEANDERTHAL FLINT WORKERS IN FRONT OF THE SHELTER OF LE MOUSTIER, the locality which gives the name Mousterian to the declining flint industry of the Neanderthaloids. The scene represents the workers aroused by the approach of a herd of wild rhinoceroses about to cross the Vézère River. After the painting by Charles R. Knight under direction of the author; permission of the American Museum of Natural History.

Fig. 31. MIGRATION OF THE REINDEER ALONG THE RIVER SOMME IN THE SPRING SEASON. Detail of large mural by Charles R. Knight painted under the direction of the author for the Hall of the Age of Man of the American Museum of Natural History. By permission of the American Museum.

Fig. 32. CRO-MAGNON ARTISTS IN THE CAVERN OF FONT-DE-GAUME depicting the procession of a herd of mammoths. The scene is reproduced after careful studies by Henri Breuil and the present author. Detail from the mural by Charles R. Knight under the direction of the author for the Hall of the Age of Man, American Museum of Natural History. By permission of the American Museum.

Fig. 33. MIGRATION OF THE WOOLLY MAMMOTH ALONG THE RIVER SOMME IN THE SPRING SEASON. Detail from large mural painted by Charles R. Knight under the direction of the author for the Hall of the Age of Man of the American Museum of Natural History. The mammoth was a favorite subject of the Cro-Magnon draftsmen, painters and sculptors, and the mural was treated in form and color with great fidelity to the famous Old Stone Age school. By permission of the American Museum.

lable influence in fostering the spiritual, artistic and imaginative side of Stone Age life. The intensified struggle for existence also increased the sense of dependence on super-

Font Robert	AURIGNACIEN SUPÉRIEUR of the shelter of Laussel Here we find the five large sculptured figures—*la bonne femme* and *le chasseur* among them—as well as narrow flint spear-heads worked on both sides with a shallow notch at the base of either edge for attachment to a shaft	CRO-MAGNON RACE
Cro-Magnon Grotto Containing the type burial of some individuals of the CRO-MAGNON RACE Gorge d'Enfer Aurignac Grotto	AURIGNACIEN MOYEN A superb flake industry, with beautiful *râcloirs* and *bifaces*	
L'Abri Audi *Lissoirs* and *pointes de Châtelperron*	AURIGNACIEN INFÉRIEUR (First of the Cro-Magnon Races) Typical *Aurignacian flint industry*	
La Quina Latest period of the NEANDERTHAL RACE	MOUSTÉRIEN SUPÉRIEUR (Last of the great Neanderthal Race) Close of the *Mousterian flint industry*	NEANDERTHAL RACE
Chez-Pourré near Brive	MOUSTÉRIEN MOYEN Typical *Mousterian flint industry* (a period of long duration)	
Combe Capelle The industry includes a few *coups de poing*	MOUSTÉRIEN INFÉRIEUR Numerous *bifaces* and remains of reindeer	
La Micoque	ACHEULÉEN SUPÉRIEUR *Bifaces* predominant. No trace of reindeer	

TABLE V. Declining period of the Neanderthal race in the stone shelters of La Micoque, Combe Capelle, Chez Pourré, and La Quina. Rising period of the Aurignacian and Cro-Magnon races in the shelters and grottoes of Audi, Aurignac, Enfer and Cro-Magnon.

natural powers and the spirit of mysticism and magic. We can only conjecture that the first cave dwellers, the Neanderthals, came under this mystical influence when they introduced the reverent burial of their dead, but among the

second cave dwellers, the Cro-Magnons and related races, we observe the birth of both spiritual and artistic powers. It must be made very clear that these new incoming races had in the distant East advanced very far in the development of these higher faculties and that they arrived in western Europe not, it is true, with a developed art but with the mental faculty necessary to artistic development. The birth of these faculties occurred in the East, not improbably on the confines of Asia and Europe, but the birth of art itself, the first manifestation of the artistic spirit, took place in the West. As shown in the remarkable works of Abbé Breuil, western Stone Age art is a very gradual development, extending over a very long period of time.

In the present lecture let us consider only the birth of sculpture and engraving as revealed chiefly in discoveries of the last decade. Since it is among the Cro-Magnons and related races that we find the first evidence of the artistic ability that expresses itself in sculpture, engraving and painting, it is interesting to have the latest word regarding the Cro-Magnon race. According to recent Swedish writers,[1] investigators have attempted to trace distant descendants of the Cro-Magnons in many countries and to associate the origin of the Nordic race with the Cro-Magnons. "At first sight, it does not seem very probable that the typically Nordic race with its long, narrow face should have developed from the Cro-Magnon type with its short, broad one. . . . Broca was the first to describe some palaeolithic finds of the Cro-Magnon type which were made in 1868, in the village of Cro-Magnon in southern France. The name itself, 'Cro-Magnon race,' on the other hand, originated with Quatrefages and Hamy (1874). The principal charac-

[1] Lundborg and Linders, Editors: The Racial Characters of the Swedish Nation, pp. 147-149.

ters of this 'race,' according to these three scientists, are the following: The man's stature is great (about 180 cm.). The skull is very long and broad, dolichocephalic (the cranial index according to later calculations in most cases below 75). The face is broad and short. The build very powerful. Only slight prognathism. The forehead steep, the root of the nose deeply sunken. Disharmony of the face, due to a great bizygomatic diameter, a narrow nose, and broad and very low orbits. . . . Hooton maintains that . . . there existed during the Stone Age in Europe two races of such nature as would make possible the development of mixed forms of Cro-Magnon type. These two races, were, in his opinion, the dolichocephalic race from Galley Hill, Brünn, Brüx, and Engis, and the Mongoloid or proto-Mongoloid brachycephals, which were represented among others by the Azilian men from Ofnet and the Neolithics from Grenelle. . . .

"Both a critical study of the abundant literature on this subject, and our own observations, have strengthened us in the opinion that in all probability no *homogeneous* 'Cro-Magnon race' has existed, but that the rather varied types which have been called so, can not for the present be considered anything but crosses arising from the mixture of different races in accordance with the Mendelian laws."

The Birth of Sculpture in Southern France

Après l'examen souvent trop aride des vestiges purement industriels de nos ancêtres les plus anciens, l'apparition des premières œuvres d'art est à l'archéologie ce qu'est à la vie de l'homme le premier sourire de l'enfance.

De nos provinces du sud-ouest qui nous apparaissent comme le foyer et le centre de dispersion de cette civilisation, l'art magdalénien se propage au nord et à l'est. A mesure qu'il s'éloigne des rives de la

Vézère ou des cavernes pyrénéennes, il perd peu à peu sa fécondité, tout en conservant les traits essentiels de ses caractères et de son originalité.—*Joseph Déchelette: Manuel d'Archéologie*, 1908.

In so far as Europe is concerned, it would seem that the art of sculpture had its birth in the imagination of men of the mixed or pure Cro-Magnon race who, about twenty-five thousand years ago, occupied a large part of western Europe, their art attaining its most intensive development in two regions, namely, the region now known as Pyrénées-Languedoc and the valley of the Vézère in Dordogne. This talented mixed race still survives in greatly diminished numbers.

Fig. 34. Old Stone Age Art and Sculpture Region of Southern France. Route of the author's tour through Carcassonne, Perpignan, Mont Louis, Font-Romeu, the Republic of Andorra, Ax-les-Thermes, Foix and Saint Girons. The estate of the Comte de Bégouen is ten kilometers north of Saint Girons.

The former region, shown on the map (Fig. 34) as Pyrénées Languedoc, with the historic centers of Albi in the north, Montpellier and Perpignan along the Gulf of Lyons, the walled city of Carcassonne in the center, the frontier post of Mont Louis and the diminutive republic

of Andorra in the south, and, on the west, the mystical grotto of Lourdes, the fashionable baths of Luchon and the glacial cirque of Gavarni, is a veritable encyclopedia of the history as well as of the prehistory of France. The latter region, about one hundred fifty miles to the north, embrac-

FRANCE	
PYRÉNÉES-LANGUEDOC REGION	
Mas d'Azil	Human figurine, horse head (with flesh removed) in reindeer horn, head of horse in act of neighing, swan, mammoth, head of flayed equine
Brassempouy	Female figure, woman's head with headdress
Lourdes (Les Espelugues)	Horse in ivory
Tuc d'Audoubert	Male and female bison modeled in clay
VÉZÈRE REGION	
Laugerie Basse	Human figurine, bovines, reindeer, mammoth head, bison head, and various animals
Teyjat	Horse head carved in lignite
Les Eyzies	Human statuette
Laussel	Four large human figures in bas relief
Raymonden (Chancelade)	Horse head in reindeer horn
Cap Blanc	Six horses cut in limestone on the cliff wall
Comarque	Horse head (bas relief)
Gorge d'Enfer	Salmon (bas relief) on the roof of the cave
OTHER PARTS	
Bruniquel	Reindeer
La Trilobite	Beetle
BELGIUM	
Trou Magrite	Human figurine
ITALY	
Grimaldi	Female figurine in soapstone
SWITZERLAND	
Kesslerloch	Various sculptures
MORAVIA	
Brünn	Human figurine in ivory

TABLE VI. The chief grottoes and shelters of France, Belgium, Italy, Switzerland and Moravia, containing sculptures of the reindeer, horse, bison and mammoth and of the male and female human figure.

ing the valley of the Vézère in Dordogne and the adjacent districts, includes the art-covered rock shelters of Laussel and Cap Blanc, with their sculptures of monumental size.

Prehistoric painting, which attained a notable development both in the Pyrénées Languedoc and in the valley of the Vézère, also reached a high level in the grotto of Altamira and other caverns of the Cantabrian region in northern Spain, but nowhere else are the treasures of prehistoric sculpture so abundant as in the two regions of France, where a number of the foremost masterpieces of this Palaeolithic art has been discovered.

The above list[1] (Table VI) of some of the best known of these treasures will serve to show their geographic distribution and the grounds for the preceding statement.

Discoveries in the Caverne Tuc d'Audoubert

The present lecture is the outcome of the author's delightful visit to the Pyrenees and Dordogne regions in 1912 and to the Pyrénées Languedoc and the collections of Laussel in 1921. In 1912 the author had the good fortune to visit the Comte de Bégouen at his home near Saint Girons twenty-two days after the discovery of the *galerie inférieure* of the cavern known as Tuc d'Audoubert. The accompanying photograph (Fig. 35) shows the entrance of this cavern—which is on the estate of the Comte de Bégouen—exactly as it appeared at the time of the discovery of the *galerie inférieure*. The central figure holding a cane and standing by the edge of the rivulet which issues from the cavern is the Comte de Bégouen; by his side is his eldest son, who has in his left hand one of the acetylene

[1]Compiled chiefly from the "Manuel d'Archéologie" of the lamented Déchelette, and amplified from Burkitt's "Prehistory" and de Morgan's "L'Humanité Préhistorique."

Fig. 35. Stream Issuing from the Limestone Mountain, Tuc d'Audoubert (*Fig.* 40, *4*), leading to the Salle des Bisons. Comte de Bégouen and his three sons in the foreground.

Fig. 36. Entrance of the Rivulet Volp into the Mountain Tuc d'Audoubert (Fig. 40, *2*).

Fig. 37. The Stalactite Chamber of the Galerie Supérieure, named Salle Cartailhac (Fig. 40, *6-C*) in honor of the late Professor Emile Cartailhac. Photograph by permission of Comte de Bégouen.

Fig. 38. The Clay Bisons of the Galerie Supérieure (Fig. 40, *6-B*). Photograph by permission of M. Jean Brunhes.

lamps used to light the difficult journey through the cavern; in the background are the two younger sons in a small boat of their own manufacture in which they followed the stream for a distance of two hundred feet when they made the original discovery of mural etchings in the *galerie inférieure*.

In August, 1921, nine years after the original discovery of 1912, the author returned to find the Comte de Bégouen more full of energy and enthusiasm than ever and ready to act as guide to the *galerie supérieure*, in which was found the now world-famous 'Salle des Bisons.' In the interval his three sons had safely emerged from the hazards of the war with decorations for gallantry.

In the early summer of 1914, before the beginning of the fatal World War, these three lads had observed a very small opening in one of the side walls of the *galerie inférieure* through which they were barely able to squeeze their slender bodies. Undaunted by difficulties, they pushed onward along what is now known as the *galerie supérieure* into the superb chamber of stalactites, subsequently designated the 'Salle Cartailhac' (Fig. 37) in honor of Professor Emile Cartailhac, the veteran archaeologist of Toulouse, whose death after a long and honorable career as the dean of French archaeology was announced in the year 1921. From the Salle Cartailhac openings lead in several directions—in fact, on the occasion of the author's recent visit his party nearly lost its way in this part of the cavern on the return trip. The labyrinthine nature of the cavern and the extreme narrowness of the passages failed to deter *les trois frères*. They courageously pushed their way onward and upward, wriggling like serpents through narrow spaces, until after a final, most difficult passage, the narrowest of

all, they entered a chamber 50 feet long and 30 feet across, with a ceiling about 12 feet high. On the floor at the end of this chamber they found traces of a small circle built of stones, and could hardly believe their eyes when their lanterns flashed upon a pair of bison modeled in clay, consisting of a cow in front and a bull following, both leaning with the left side against a large mass of clay (Fig. 38).

Thus through the courage and enterprise of these three lads was made one of the most astounding discoveries in the whole history of French archaeology, namely, that *the sculptors of Palaeolithic times were familiar with the use of modeling clay and employed this as a medium of expression and perhaps even for preliminary study of works subsequently to be executed in the more enduring medium of stone, exactly as our sculptors do today*. The sculptors who courageously penetrated the *galerie superiéure* some twenty-five thousand years ago were also extremely skilful in the use of this clay, and the photographs taken by the Comte de Bégouen and M. Jean Brunhes by the aid of acetylene light convey little idea of the extraordinary accuracy of the great lines of musculature indicated in the fore quarters, neck, and head.

The Count's three sons did not tarry to make such detailed observations as these, but hastened back to announce their discovery of the Salle des Bisons to their father; and to our mind the courage which the sons displayed was less remarkable than that of their father, who immediately returned to make the same most difficult ascent into the *galerie supérieure*. How the Count ever succeeded in forcing his stalwart figure through the narrow passages—impossible to any but the most accomplished 'cavernist'—we cannot imagine. At the time of our second

visit to the cavern in 1921 iron ladders, steps, and other aids to the ascent had been prepared, and inconvenient masses of limestone had been chiseled down; but notwithstanding such provisions the ascent was the most difficult and arduous of its kind that we have ever undertaken. At one point it was necessary literally to crawl upon one's face —*ventre à terre*—and when halfway through we were forced to turn on one side because the two pillars of limestone are too close to allow the shoulders and hips to pass. Our admiration of the Comte de Bégouen increased every moment. When finally we emerged into the Salle des Bisons, we were physically completely out of breath but spiritually we were prepared for the greatest impression of our life, namely, *the sight of an atelier preserved exactly as it was left by the prehistoric sculptors twenty-five thousand or more years ago*, with the bison models still soft to the touch and the mass of clay as yet only slightly contracted by desiccation, exhibiting two vertical cracks in the figures which are clearly shown in the photograph by M. Jean Brunhes (Fig. 38).

The mass of clay against which these bison lean is also clearly shown. The tail of the right-hand (female) bison has dropped to the ground. On the other side of the mass of clay is a third, uncompleted figure of a bison, and a model of a fourth partly finished. Near by are several rolls of fresh clay, indicating that this material was carefully worked before being applied to the model.

It is impossible to convey any idea of the impression made upon our mind by the Salle des Bisons and especially by the two central figures which give it its name. As the light from the lantern is slowly passed round these sculptures, one realizes that they are triumphs of impression-

ism. The effect is one of suggestion conveyed by strong, sure strokes of the modeling tool. There is absolute truth of proportion, and to this all matters of detail and retouch are subordinate.

Not far distant from the bison models is a small, depressed chamber where one can observe fresh prints of hands and feet—the footprints being of very delicate type, deeply impressed into the fresh clay, and subsequently covered with a very thin coating of limestone. This recess

Fig. 39. Foot Impression of the Sculptor of the Bisons. Heel-cast from the Salle de Danse adjoining the Salle des Bisons in the cavern of Tuc d'Audoubert. 2-3 actual size. Presented to the American Museum of Natural History by the Comte de Bégouen.

is called the 'Salle de Danse,' although there is no evidence of any such ceremonial having taken place here. The delicate heel prints (Fig. 39) are limited in number and may well have been made while the sculptors were gathering clay for the bison models. In fact, there is no evidence that this chamber was devoted to any purpose other than the execution of these bison sculptures and it may never have been visited again.

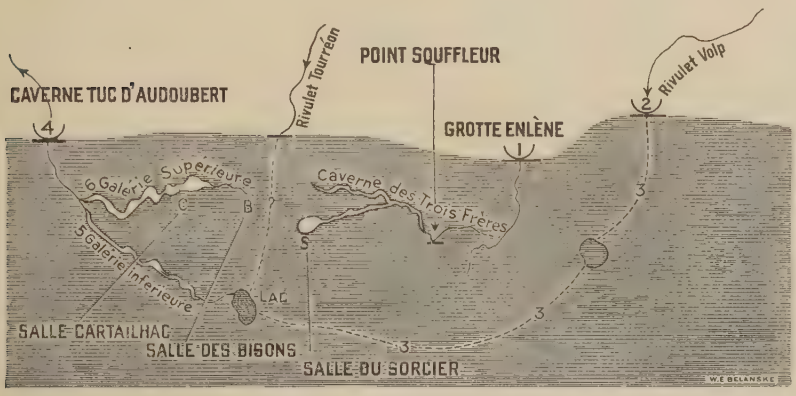


Fig. 40. Interior of the Limestone Mountain of Tuc d'Audoubert near Saint Girons. Compare Figures 35, 36, 37, 38.

Such is the ever recurring mystery of Palaeolithic purpose and art. The subject of the two bison, male and female, relates to the reproductive instinct and not directly to the chase, as in the case of the bison drawn in the not far distant cavern of Niaux with arrows indicated on their sides.

As we return from the Salle des Bisons and descend along the *galerie supérieure* there are evidences of occupation, not only by the cave bear but by cave man, who has left

little heaps of scattered implements and bones showing that several parts of the cave had been inhabited by the Stone Age men for short periods during the winter season —perhaps when the constant internal temperature of 12½°C. (54½°F.) rendered the interior far more habitable than the country without, subject as that was to the severe climate of the Pyrenees in the Ice Age.

Discovery of the Etchings in the Caverne des Trois Frères

At the top of the same little limestone mountain containing the cavern of Tuc d'Audoubert is an opening long known to the shepherds of the region as the 'Point Souffleur,' from which the relatively warm air currents of the cavern issue in winter and melt the snow, while relatively cool breezes issue in summer (Fig. 40).

On July 20, 1914, the Bégouen brothers suddenly decided to descend this rock chimney and see where it led, another very hazardous proceeding. They were let down by a long rope and upon reaching the bottom found themselves in an entirely new cavern, which has since received the name of 'Les Trois Frères' in honor of its discoverers.

Upon receiving their report, for a second time the Comte de Bégouen hurried to the spot, ran all the risks, and verified this fresh discovery by his three sons. Even the preliminary survey made by these youths revealed that, though not far distant from the cavern of the Tuc d'Audoubert, it represented an entirely different art period and a cavern technique of another order; that its walls were fairly covered with designs; and that the relatively few flint-incised outlines were executed in an entirely different style.

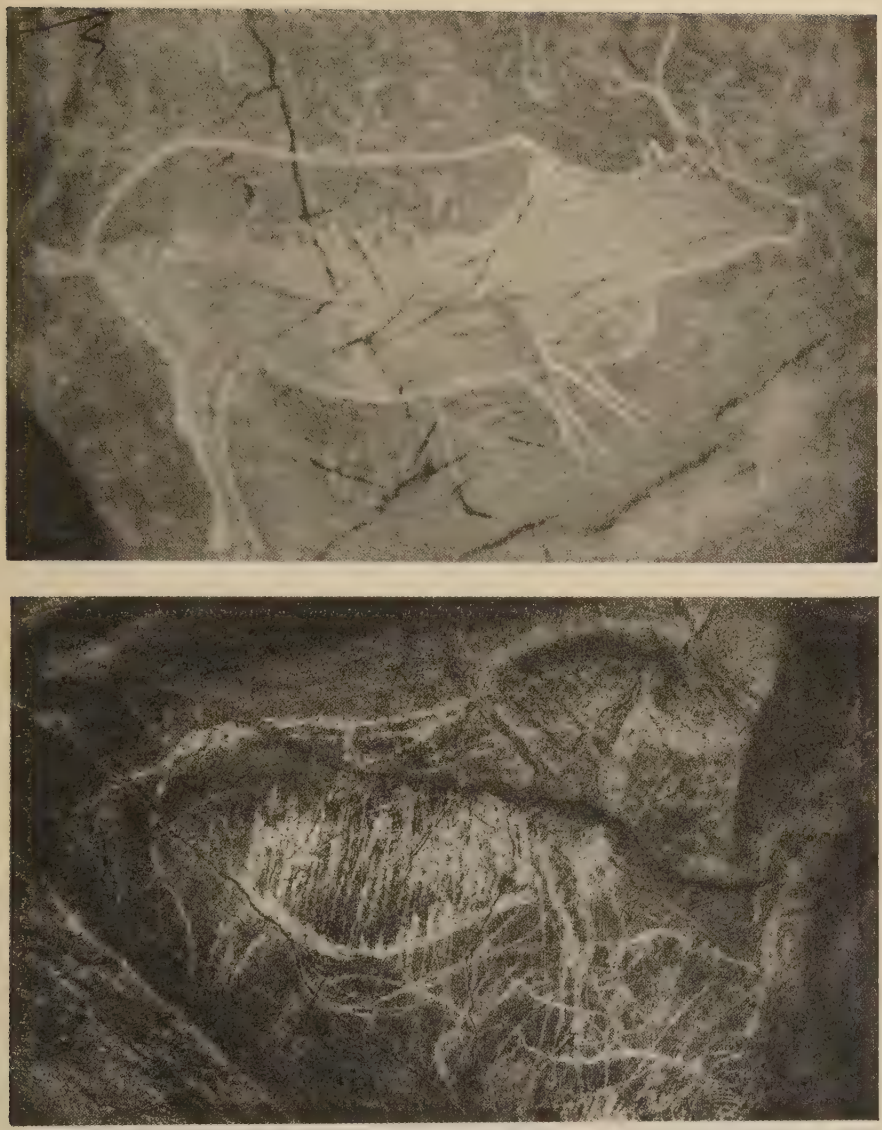


Fig. 41. Wall Etchings in Les Trois Frères. The light effects are produced by the removal of the brown coating of the limestone. The reindeer of the period (*upper*) and the Celtic horse (*lower*) are beautifully represented, particularly the latter with its bushy tail, erect mane, small head and ears and delicate limbs. Photographs by permission of Comte de Bégouen.

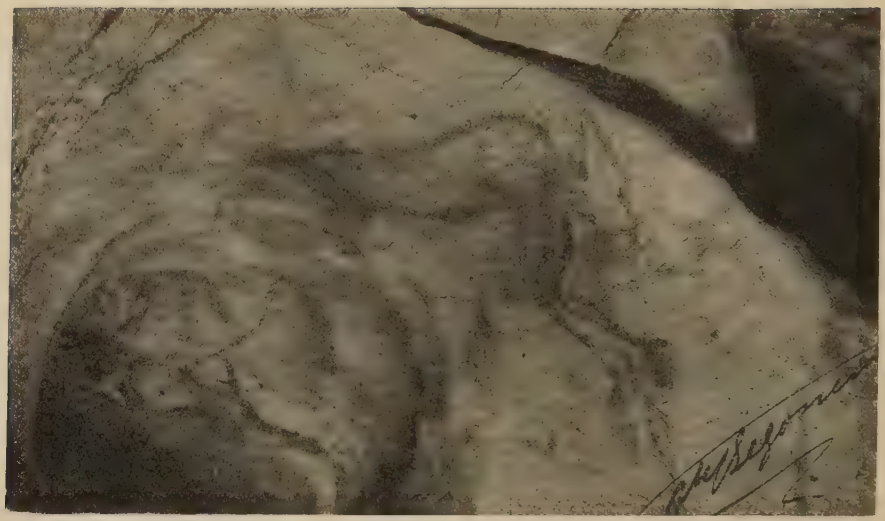


Fig. 42. The Sorcerer of Les Trois Frères. Painting and engraving on the roof of the magic chamber, or Salle du Sorcier (Fig. 40, *S*). Photograph by permission of Comte de Bégouen.

Fig. 43. The Sorcerers of Lourdes and of Les Trois Frères. *Left*: This engraving was found on a piece of schist rock in the Grotte de Lourdes and is preserved in the Musée de Saint Germain. About 1-2 actual size. *Right*: Interpretation by Abbé Henri Breuil of the painting and engraving in the Salle du Sorcier (Fig. 42). 1-15 actual size.

Every available surface of the cavern of Les Trois Frères, whether ceiling or sides, has a design upon it, and it has required two seasons of very hard work on the part of the eminent historian of prehistoric art in France, the Abbé Henri Breuil, to reproduce these etchings. We had the pleasure of meeting the Abbé Breuil at the Château des Espas, the residence of the Comte de Bégouen, and learned from him that there was still several months' work to be done. The walls which the prehistoric artists faced were uniformly covered with a brown coating quite unlike that of the limestone of other caves; under this coating lies the yellow-white limestone surface. By scratching off the coating the etchers produced a strong *white* contour line, unlike the black painted manganese contour line which outlines the animals pictured in the Niaux cavern; quite different also from the deep, flint-incised outlines seen in the adjacent cavern of Tuc d'Audoubert.

This etching is well shown in the reindeer and the small Celtic horse reproduced herewith (Fig. 41). The photographs do not reproduce with sufficient clearness the effect of these etchings, therefore the whites and blacks have been slightly intensified to convey to the eye the effect actually given when such etchings are surveyed with a powerful acetylene light.

So perfectly portrayed are the exact proportions and characteristics of these two animals, the reindeer and the Celtic horse, that, even if they be critically examined by a zoölogist, there is no mistaking either the genus or the species to which they belong. The distinguishing points in the Celtic horse are the small head and the high, arched neck and white mane of the stallion. In the reindeer the broad contour lines beneath the head and the body, which

are part of the scheme of protective coloration or concealment, are indicated by removing the brown surface of the cavern wall from a considerable area, leaving only a patch of brown here and there to indicate the limbs and shading. In the case of the Celtic horse the white coloring extends beneath the jaw and the belly line. Thus not only the contour but also the coloring of these two animals is very clearly and characteristically indicated. The entire silhouette of the upper part of the body is absolutely accurate and true to life.

This unique style and greater freedom in drawing and etching distinguish all the work found in the Caverne des Trois Frères, on the walls of which are outlines and etchings of all the characteristic mammalian life of the period, namely, the horse (of different species) and the reindeer (a single species)—both favorite subjects—the mammoth (less frequently portrayed), the bear, the lion, the panther, the stag, and—most numerous because most coveted for food—the bison. All these animals and others more recently discovered are portrayed with the same fidelity by these Palaeolithic artists; here we have a complete portrayal of the mammalian life of the Pyrenees in this early period of Magdalenian art, probably antecedent to that phase of mural painting which distinguishes the final period of Magdalenian art.

Although improved and widened at narrow points the cavern is still very difficult of access—"*très pénible*," in the words of the Count. One must crawl, stoop, turn on one's back or side in order to pass certain points, yet it has been visited frequently by the Count and by the late dean of French archaeologists, Emile Cartailhac.

Discovery of "The Sorcerer" in Les Trois Frères

Again the *élan* of the 'cavernist' carried us through all difficulties into the final chamber, on the ceiling of which we perceived in faint relief the painted figure of the Sorcerer. We were at last in the Salle du Sorcier, where, surrounded by numerous etchings, this strange medicine man presides. To the painstaking and minute observation of Abbé Breuil we are indebted for the elucidation of all the details presented in the accompanying drawing (Fig. 42).

The interest of this figure of the *Sorcier* is enhanced by the fact that it is not a unique representation. Though far more perfect and of larger size, it strikingly resembles the engraving of a sorcerer found many years ago in the now miraculous grotto of Lourdes in the eastern Pyrenees (Fig. 43). Each figure is terminated with a fox's tail and is surmounted with the horns of a stag, and from each face hangs the long, pointed beard. The Trois Frères figure is technically superior to the Lourdes in showing the mask and ears of a fox and the apparent insertion of the arms of the sorcerer in the pelage of the forearm of a bear or some other carnivore—that is, the hands are masked like the face, while the feet, the trunk, and the thighs are either covered with fur or, more probably, painted in stripes. The remainder of the body of the sorcerer is etched on the brown-coated rock very much in the same manner as the animals are etched in other parts of this wonderful cavern. The figure is represented partly stooping, in a gesture which the Count well describes as "*le geste de faire le beau*," an attitude which is also observed in some of the drawn figures in

the grotto of Combarelles. Following his description of this strange figure, the Comte de Bégouen writes:

> Ce mélange de caractéristiques nous fait écarter également l'idée d'une mascarade rituelle spéciale. Catlin, à qui il faut toujours revenir, nous décrit des danses de l'ours ou du bison dans lesquelles le ou les participants revêtent les têtes de l'animal qu'il convient d'honorer et de rendre favorable ou au contraire de détruire. Si donc l'imagination s'est donné libre carrière dans la confection en quelque sorte synthétique de l'accoutrement, c'est qu'il s'agit de représenter soit un esprit supérieur ayant par conséquent les attributs des différents animaux qu'il domine, soit l'homme capable par son pouvoir magique d'en être également maître. Nous avons des quantités d'exemples de l'un et de l'autre cas chez tous les peuples primitifs, des Esquimaux aux Australiens en passant par les indigènes de l'Afrique ou de l'Amérique, les Sounis en particulier.
>
> Dans le premier cas, il s'agirait de la représentation d'une sorte de divinité, dans le second, de celle d'un sorcier. C'est vers la seconde hypothèse que nous penchons. Nous croyons que l'artiste quaternaire a voulu représenter un magicien. Dans quel but, nous l'ignorons. Rien ne nous permet de deviner la mentalité qui était la sienne ni la préoccupation à laquelle il a obéi.
>
> Il semble que cet artiste, c'était le sorcier lui-même, qui aurait tracé avec minutie et fidélité son propre portrait revêtu de ses attributs rituels. Il l'a placé dans le recoin le plus reculé de la caverne inférieure, mais sur une paroi dominant ces centaines de figurations d'animaux que lui ou ses confrères ont, pendant de longues suites de générations, tracées pour des envoûtements. Car tout dans cette caverne nous parle de magie.

None of these wall drawings or paintings is removable. The figure of the sorcerer itself is not very conspicuous and to make out all its characteristics has required the most microscopic study on the part of the Abbé Breuil. It was necessary for the author to visit this cavern personally in company with one of the archaeologic experts of France to appreciate the full meaning of this art and to discover the inconspicuous but most significant pictures.

There is little doubt that this entire mural art is con-

nected with the spirit of the chase, with the exception of the sorcerer, which may have a magic significance similar to that of our 'medicine men.'

The Human and Equine Sculptures of Laussel and Cap Blanc

In the more northern art center around the valley of the Vézère is the grotto of Laussel (Fig. 44), where Dr. Gaston de Lalanne worked for many years and was rewarded by the discovery of the most remarkable series of prehistoric sculptures of the human figure which have been found in France.

The figure which Dr. Lalanne in his capacity of student of prehistoric remains calls "*la bonne femme de Laussel*" (Fig. 45) was found at the point indicated by a white cross on the projecting point of rock beneath the shadow of this grotto, which Lalanne regards as possibly an ancient sanctuary. *La bonne femme* has the robust proportions of all the feminine statues of the period and, like the others, is the work of a race which held that maternity is the chief end of womanhood. There is no effort at the expression of either beauty or proportion in the feminine figure, and the rough brown sandstone does not admit of anything in the nature of delicate sculpture of the face and head—a part of the human body far too difficult for the sculptors in this remote Aurignacian period of the development of their art. A second figure of a woman is inferior in design to *la bonne femme*. A third feminine figure is more or less symbolic of the act of parturition.

None of the feminine figures betrays any attempt on the part of the artist at the expression of the beauty of the human form and we might infer that the Cro-Magnon artists

of this time—so keen to portray the beauty of the animal form—were indifferent to beauty in mankind, were it not for the companion statue of *le chasseur* (Fig. 45), which Dr. Lalanne found within a few feet of *la bonne femme*. We had the privilege of examining all these statues in a powerful light in Lalanne's studio in Bordeaux, and were deeply impressed, not only by the real beauty of the masculine figure of the hunter, but by the evidence it gave of surprisingly close observation of anatomical detail. The pose is extremely fine and the figure may be conceived as in the act of either throwing a spear or drawing a bow. The broad shoulders and slender, girdled waist remind us strongly of figures of Apache Indian runners and hunters, and also of the slender-waisted cup-bearers from the palace of Cnossus, Crete. The body faces slightly toward the front, and one may perceive the line where the thorax joins the abdomen—that is, the lower line of the ribs—above the slender abdominal line of the typical hunter. More remarkable, at the top of the shoulder one can perceive the swelling of the deltoid muscle and the point where it subsides into the brachialis muscle as in the modern athlete. The head is turned to the left, indicating that the face was turned in the direction of the spear or of the arrow, but there are no indications of the features—in fact, it would have been impossible in this coarse sandstone and with the tools then available to model the human features.

Close of the High Sculpture Period

Dr. Lalanne has a superb collection of Aurignacian flints, including hammer stones and chisel-like implements with which the sculptor may have worked. His atelier is crowded with a series of implements which give us all

Fig. 44. The Rock Shelter of Laussel, supposed to be an ancient sanctuary, which contained four Palaeolithic bas-reliefs in stone, including those known as *le chasseur* and *la bonne femme de Laussel*. The latter was on the stone indicated by a white cross. Reproduced by permission of the late Dr. Gaston de Lalanne of Bordeaux.

Fig. 45. Stone Sculptures of Laussel, of late Aurignacian age. About 1-6 actual size. *Left*: *La bonne femme*, bas-relief of a woman with a drinking horn. *Right*: *Le chasseur*, bas-relief of a spear-thrower or archer, sculptured on the face of a boulder within the rock shelter (Fig. 44).

Fig. 46. The Famous Celtic Horse of Cap Blanc. Sculpture in high relief of a life-sized horse of early Magdalenian age, now one of the national monuments of France. After Lalanne in *Anthropologie*, 1911.

phases of the grand Aurignacian flint industry. Near the *bonne femme de Laussel* was found an assemblage of the finest types of flints—possibly an accidental association, though Dr. Lalanne considers that the sculptors probably employed a variety of implements in roughing out and preparing the ambitious statuary of his priceless collection. Of the same upper Aurignacian age is a number of very large implements—hammer stones, planing stones, and *pics* —which were well adapted to this massive work and to such undertakings as the subsequent Magdalenian horse sculpture of Cap Blanc (Fig. 46). To the prehistoric archaeologist the age of these statues is the matter of commanding interest; it is determined by the excavations of Dr. Lalanne as *Aurignacien supérieur* beyond the possibility of doubt.

We may point to the industrial parallels which Lalanne finds between the grotto of Laussel and other famous and typical sites as indicated above (Table v). We are not inclined to accept his theory that the Laussel sculptures represent the negro-like Grimaldi race of Mentone which, our readers will recall, is the only Palaeolithic race with the negroid type of face thus far discovered, and which is represented by two skeletons found in the Grottes de Grimaldi on the Mediterranean near Mentone.[1] Our principal ground for dissenting from the theory that the Grimaldi race was portrayed in the Laussel sculptures is that repeatedly expressed in "Men of the Old Stone Age," namely, that all this art, both mural and sculptural, appears to be the product of a single racial mind and racial spirit. New types of implements may have come in by invasion, but in the orderly development of a single art—an

[1] Compare Osborn: Men of the Old Stone Age, pp. 262-269.

art marked by the combined love of beauty and truth—we have the most positive proofs of the craftsmanship of a single race. That race was probably of the pure or mixed Cro-Magnon type.

Unfortunately little evidence is afforded by burials. Thus far no evidence of the practice of human burial has been found in any of these excavations at Laussel. It is true that in the search for burial places Dr. Lalanne came upon the famous series of sculptured horses at Cap Blanc, which are regarded as belonging to the art of early Magdalenian times and therefore as somewhat more recent than the human sculptures of Laussel.

IV

OUR ANCESTORS ARRIVE IN SCANDINAVIA

. . . I first slaved to the yoke
Both ox and ass. I the rein-loving steeds
(Of wealth's gay-flaunting pomp the chiefest pride)
Joined to the car; and bade them ease the toils
Of laboring men vicarious.
I the first
Upon the lint-winged car of mariner
Was launched, sea-wandering.
Such wise arts I found
To soothe the ills of Man's ephemeral life;
But for myself, plunged in this depth of woe,
No prop I find.
. . . . . .
Chiefest of all, the cure of dire disease
Men owe to me. Nor healing food, nor drink,
Nor unguent knew they, but did slowly wither
And waste away for lack of pharmacy,
Till taught by me to mix the soothing drug,
And check corruption's march. . . .
. . . Yet more: I probed the Earth,
To yield its hidden wealth to help man's weakness—
Iron, copper, silver, gold.

—*Aeschylus: Prometheus Bound.*

OUR ANCESTORS[1] ARRIVE IN SCANDINAVIA

The rudiments of architecture, of mining, of navigation — The Mesolithic or transitional period — The glaciers give prehistoric chronology — Northward migration of the Campignian flint workers — Successive reindeer, moose and stag periods of Denmark and Sweden — The shell mound period of Denmark — Divisions of the Bronze and Neolithic ages in Denmark and Sweden — Beginnings of Mediterranean trade

THE fourth scene of human prehistory shifts from the Dawn Man of East Anglia, from the long empire of the low-browed Neanderthaloids, from the art-filled caves and shelters of the Pyrenees, to the stern northern shores of France and Belgium, where the flint workers and boat builders of Campigny battled with the forests, streams and creeks.

The flint workers of Campigny inaugurated in western Europe a new period of prehistoric civilization with two new implements, namely, the stone axe (*tranchet*) and the stone pick-axe (*pic*), which were probably brought from the East. With these implements they were able to make openings in the forests for their dwellings, to build rude boats in which to explore the northern rivers and creeks, and to mine for finer grades of flint. Thus man rose to the rudiments of architecture in constructing his dwelling places, to the rudiments of mining the earth, and to the

[1] Perhaps few people realize how many of the surnames of native-born Americans are, either directly or ultimately, of Scandinavian origin. An instance of this is afforded by both family names of the present author. Osborn is a variant of the Old Norse name 'Asbiorn' = divine bear (O.N. as, divine + biorn, a bear), Anglicized into Osbeorn, Osbern, Osborn = a godlike warrior (O.E. os, a god + be(o)rn, a warrior). Two Osberns are recorded as killed in battle in A.D. 1054 and the name is of common occurrence in the Domesday Book. Sturges (= Sturge's son), the surname on the distaff side, is somewhat obscure in derivation but seems to be related to the O.E. 'sterced' = stern, stout, strong, and perhaps to O.E. 'stearc' = rigid, stern, strong.

rudiments of navigation in building his boats. Around the dwellings grew up the rudiments of village and communal life; the boats made possible the rudiments of trade and of commerce, while extending the art of fishing which added marine fish and molluscs to the northern diet.

The great flint industry known as the Campignian, named after its type station of Campigny, northern France, was especially adapted to the needs of a hardy northern race living in a forested country along river banks or seashores, where there could be no recourse to limestone caverns or grottoes for shelter. These closing Stone Age people built their *cabanes* (huts) partly below ground, probably stretching the hides of animals over arched poles. Such a style of building—not unlike that still in vogue among the nomadic peoples of Mongolia and northern Siberia, in

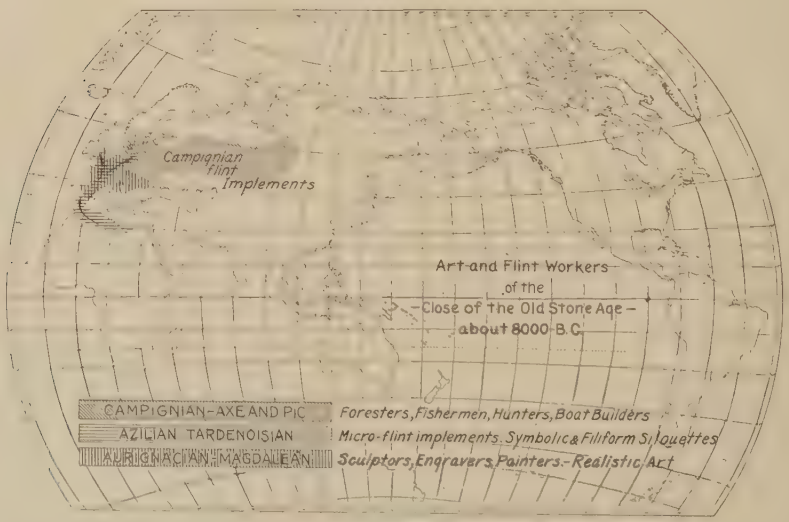


Fig. 47. Flint Industrial Areas of Western Eurasia During the Closing Period of the Old Stone Age. Vertical lines: sculpture and painting period of the Aurignacian and Magdalenian workers. Horizontal lines: northward spread of the Azilian and Tardenoisian micro-flint workers. Oblique lines: eastward and westward distribution of the Campignian foresters and miners with *tranchet* and *pic*.

which the fire is placed in the center of the dwelling and the smoke emerges through an opening in the roof—called for a constant supply of seasoned firewood, while the streams and the inlets of the adjacent seashores rendered urgent the need of canoes.

The Mesolithic or Transitional Period

The Campignian flint industry in northern France which supplied western Europe with the flint axe and flint pick-axe is dated about 8,000 B.C. This period is also known as the Mesolithic; it is a transition between the Palaeolithic and the Neolithic. The prehistoric civilization of western Europe is now accelerated by the successive arrivals of new races of man bringing new arts and industries from western Asia, where prehistoric civilization was far more rapid, owing to the increasing aridity of the country and the absence of forests. These arrivals from the East and from north Africa bring the micro-flint industries known as Azilian and Tardenoisian (13,000 B.C.), the Neolithic art of agriculture, later the copper and bronze industries and, finally (600 B.C.), iron (Table VII).

The present lecture covers the eight millenniums of time from the close of the Reindeer Period of the Old Stone Age in France (11,000 B.C.), known as the Palaeolithic art age, to the Age of Bronze in Scandinavia, about 2000 B.C. For three reasons this period of eight thousand years is of special interest: First, it witnessed the arrival of our own northern ancestors in northwestern Europe. Second, as the Mesolithic or transition stage, it fills in the interval of prehistory, until recently unknown and mysterious, that lies between the Magdalenian industry of the Cro-Magnon race

EUROPE AND THE ORIENT

Approximate chronology of the Palaeolithic, Neolithic, Copper, and Bronze cultures of western Asia and Europe. These dates are largely conjectural and may be greatly modified by future discoveries.

SCANDINAVIA AND DENMARK

Archaeologic chronology of southern Scandinavia as given to the author by Oscar Montelius in the summer of 1921, slightly modified by the more recent determinations of De Geer and Antevs that the ice retreated from central Scania not earlier than 11,500 B.C.

	B.C.	
AGE OF IRON in central Europe	600	
AGE OF BRONZE in central Europe, France, Spain HORSE domesticated in the Orient	2000	AGE OF BRONZE
	2200–1700	STONE CISTS. Inferior pottery First appearance of BRONZE in Sweden
COPPER used in central Europe and France AGE OF BRONZE in Troy, Greece, and Sicily	2500	PASSAGE GRAVES. Painted pottery. First appearance of COPPER
AGE OF BRONZE in Egypt and Chaldea COPPER used in Troy, Greece, Sicily, Hungary, and Spain	3000	Earliest Scandinavian SKULL of NORDIC type DOLMENS—round or rectangular
COPPER used at Anau, Turkestan	4000	Dawn of the NEOLITHIC. No Megalithic tombs. Stone axes and picks developed
COPPER used in Egypt and Chaldea	5000	SHELL MOUND and CAMPIGNIAN cultures. STAG PERIOD
	6000	
	7000	OUR ANCESTORS ARRIVE IN SCANDINAVIA with large flint implements and axes of reindeer horn
CAMPIGNIAN culture in France NEOLITHIC culture at Anau, Turkestan	8000	MAGLEMOSE (Mullerup) culture of Denmark—DOMESTIC DOG
	9000	MOOSE (ELK) PERIOD in Scania

Close of REINDEER PERIOD in southern France	11,000	REINDEER PERIOD in Scania
	11,500	Final retreat of the Scandinavian Glacier from southern Scania
Crete settled	12,000	
AZILIAN and TARDENOISIAN micro-flint industry from Spain and north Africa	13,000 14,000 15,000	
MAGDALENIAN (Palaeolithic) art culture in France NEOLITHIC culture at Susa, Persia	16,000	REINDEER PERIOD in northern France
Beginning of NEOLITHIC in southwestern Asia	17,000 18,000	
ORIENT and FRANCE		DENMARK and SWEDEN

TABLE VII. Chronology of west Asiatic, Egyptian, Cretan, European and Scandinavian cultures

of artists—that is, the close of the Old Stone Age in Europe—and the dawn of the New Stone Age, characterized by the practice of polishing stone implements, the pursuit of agriculture, and the domestication of animals. Third, it has recently (1910) become possible to assign to these industries dates of even greater precision than the dates assigned to the dawn of civilization in central Asia, Mesopotamia and Egypt. Within the period of eight thousand years our ancestors arrived in northwestern Europe and Scandinavia and passed through a long hunting stage of evolution with only flint implements; through all the Neolithic phases; through a superb development of the art of both flint and bronze; and into the culminating period of the Age of Iron.

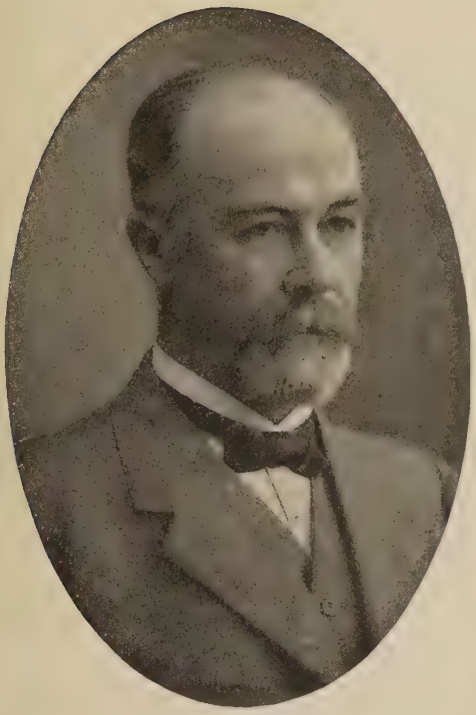
The Glaciers Give Prehistoric Chronology

Geology furnishes the chronometer in the seasonal melting of the Scandinavian Glacier with its annual deposits of the fine ice-born clay by which the years are recorded as distinctly as in the annual ring growths of trees. The discovery that the thick clay layers near Stockholm correspond with warm seasons of rapid melting, and that the thin clay layers correspond with cool seasons of slow melting, suggested to the ingenious mind of Baron Gerard De Geer that here was the long-sought time clock of glacial recession. By the year 1910 he had confidently announced a "Geochronology of the Last 12,000 Years." Then began a decade of persistent research along the ancient ice-borders of Scandinavia and, more recently, of northeastern America, which has not only confirmed his original theory, but of late[1] apparently promises a means of fixing precisely the date of postglacial time in the whole northern hemisphere. The date when our Nordic ancestors arrived in Scandinavia is thereby set by Baron De Geer and by Oscar Montelius, the distinguished archaeologist of Scandinavia, as 8,000 B.C. for a conservative minimum and 11,000 B.C. for a maximum.

Montelius was also enabled to affix the glacial millenniums of De Geer to his previous subdivisions of the early cultures of Sweden and Denmark and to propose a series of dates far more precise than those given for any other prehistoric region of the world (Table VII).

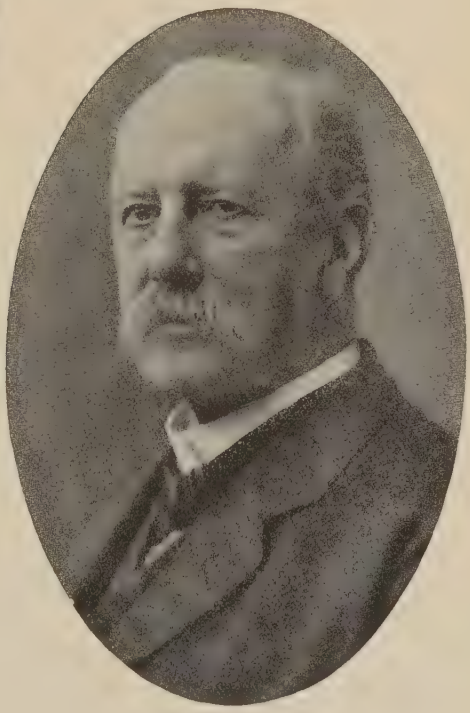
This definite and reliable chronology afforded by the glaciers is doubly welcome because the old divisions of the

[1]Gerard De Geer: Correlation of Late Glacial Annual Clay Varves in North America with the Swedish Time Scale. *Geologiska Föreningens i Stockholm Förhandlingar*, Bd. 43, H. 1–2. January-February, 1921.



(*Left*)

GERARD DE GEER, the leading geologist of Sweden, who established (1910-1921) the glacial chronology of Scandinavia through the discovery of the clay laminae left by retreating glaciers.



(*Right*)

OSCAR MONTELIUS, the leading archaeologist of Sweden, who established the entire succession of the Neolithic, Bronze, and Iron Age cultures in Sweden, and—shortly before his death—connected the archaeology with the glacial chronology of De Geer. Through the death of Montelius on November 4, 1921, the study of the prehistory of Europe has suffered an irreparable loss. Widely known as the leading archaeologist of Scandanavia, he was for more than fifty years a constant contributor to the scientific journals of his own and other European countries. He was an accomplished linguist and author of numerous books; he was for many years director of the National Museum of Sweden, an office which he subsequently resigned in order to complete a series of monographs on the unique collections assembled there.

Fig. 48.

Fig. 49. BEGINNING OF THE NEOLITHIC OR NEW STONE AGE IN NORTHERN EUROPE. Nordic hunters returning with a stag, which has replaced the reindeer. The dog and pottery indicate the Neolithic Age; the spearheads and axes are still of chipped flint. From mural by Charles R. Knight under direction of the author. Permission of American Museum of Natural History.

Fig. 50. SURVIVAL OF THE STONE AGE IN NORTH AMERICA. Indian flint workers fashioning arrow heads. The Campignian *tranchet* and *pic* never penetrated North America. Permission of U. S. National Museum.

prehistory of Europe into the 'Old Stone Age,' 'New Stone Age,' 'Age of Copper,' 'Age of Bronze,' and 'Age of Iron,' no longer suffice. They are not only too broad, but they are too indefinite, since it is now well known that these cultures overlapped, so that the Old Stone Age of one region corresponds with the New Stone Age of another, and with even the Bronze Age of a third. Scandinavian culture lags from one to three thousand years behind corresponding Asiatic culture.

Not only this overlapping of cultures and industries, but the gradual transitions between these periods—the intermediate stages recently discovered—render a new prehistoric chronology necessary. This is especially true of the time when our Nordic ancestors arrived in Europe, when the stag had replaced the reindeer all over France and Bel-

Fig. 51. Advance and Retreat of Glaciation IV. The fourth great glacier from Scandinavia swept southeastward over the site of the present cities of Berlin and Leningrad during the final struggle of the Neanderthal race in western Europe in its period of Mousterian flint industry. As Glaciation IV retreated northward, leaving Germany, Denmark and ancient Scania free of ice, this region was invaded by the Campignian flint-workers and boat-builders, who were followed by Neolithic agriculturists.

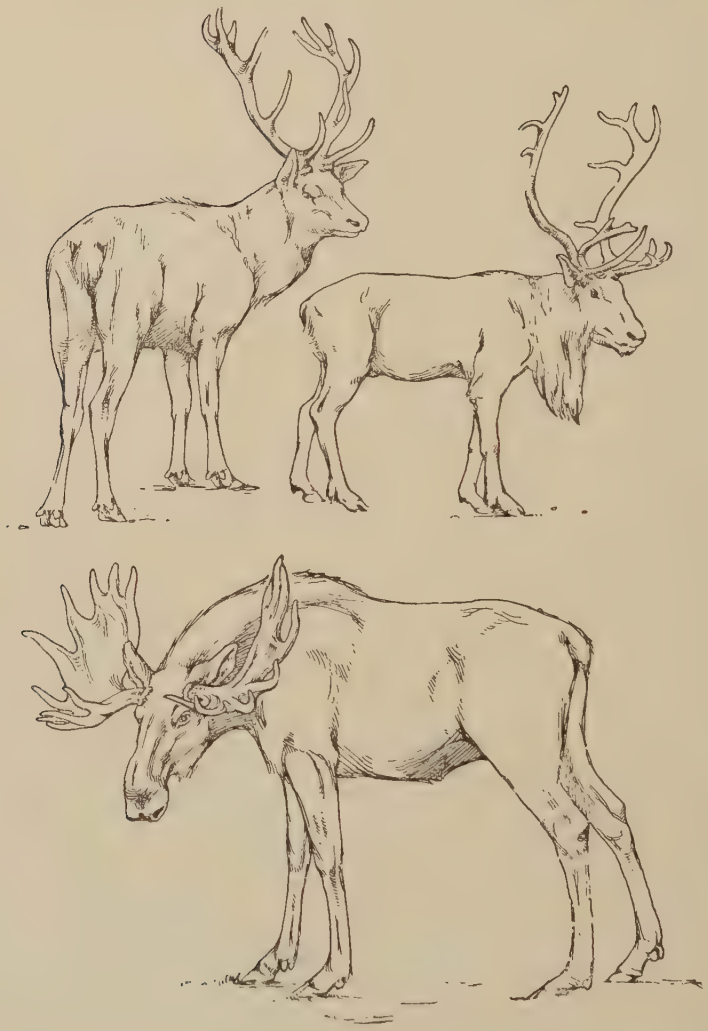


Fig. 52. Reindeer, Moose and Stag of Campignian Age. The reindeer migrated southward to the Pyrenees during maximum Glaciation IV and then slowly retreated northward to Scandinavia about 11,000 B.C. The moose (Scandinavian elk) wandered southward to northern Spain during maximum Glaciation IV and retreated northward to Denmark, where its bones and horns were used to make weapons and tools in the Maglemose industry of about 7000 B.C. The stag, depicted by the Magdalenian artists of northern Spain, moved northward, appearing in early Campignian and Shell Mound deposits of Denmark and Sweden about 5,000 B.C.

gium, and even the moose, or Scandinavian elk, had retreated northward into Denmark, while the reindeer was following the snow fields and retreating ice northward from Denmark into southern Scandinavia.

Northward Migration of the Flint Industries as the Reindeer, Moose and Stag Moved Northward

When we realize that the economic and family life of this period, the food and clothing and many implements, depended upon the reindeer, the moose and the stag, we secure the key to the origin of a variety of human habits and inventions which moved northward twelve hundred miles from Spain to southern Scandinavia. During the period of high Magdalenian art of the Cro-Magnon race the reindeer had penetrated Spain south of the Pyrenees and was abundant in the cave region immediately north of the Pyrenees. Its hide furnished clothing; its flesh and marrow bones served as food; from its horns and leg-bones were fashioned the tools and weapons of the time.

The slow northward retreat of the reindeer began after the time of the maximum cold of the Fourth Glaciation and continued for from eight to ten thousand years, during the whole period of the development of the Upper Palaeolithic cultures, namely, the Aurignacian, Solutrean and Magdalenian, and into the period of the minute flint industry known as the Azilian-Tardenoisian. With this northward retreat of the reindeer went the hunting tribes in pursuit, carrying with them all the inventions, all the devices which tended to make their life more comfortable or to facilitate the capture of fish or game.

It is in the extreme north, close to the retreating ice sheet of the Fourth Glaciation that, through the genius of

Fig. 53. WIDE GEOGRAPHIC DISTRIBUTION OF THE CAMPIGNIAN FLINT INDUSTRY. After Salmon, d'Ault du Mesnil, and Capitan in 1898, to which the following sites (indicated by numbers in circles) have been added: 1—Campigny, France, type station of the Campignian culture. 2—Mullerup (Maglemose), type station of the Maglemose culture, and Svaerdborg, where extensive industrial remains of Maglemose type have been discovered. 3—Region of extensive Campignian quarries in Belgium, explored by M. Hamal-Nandrin and others. 4—General region on the southeastern coast of Scania, Sweden, where Campignian implements are found. 5—Campignian outposts of Norway.

Baron De Geer, we are enabled to assign exact dates, not only to the successive northward migrations of the deer, moose and stag, but to the corresponding waves of human invention and human migration and to the interchange of weapons of the chase and tools of successive industries.

Some of these inventions, like the flint hide-dressers and scrapers, date away back to the Stone Age time when the Piltdown man and the Foxhall man inhabited western Europe. Man seldom casts away an old invention unless it becomes entirely useless. Other inventions of the art age, like the bone sharpeners and scrapers, finely retouched flint tools, also flint borers used in perforating bone, date back to Aurignacian times when the manufacture of bone implements began to flourish. Still other inventions, like the minute geometric flints known as Tardenoisian, date only

from the Stag Period, which was post-Magdalenian. It is wonderful to find these tiny flints—as pointed out to the writer by Dr. Hamal-Nandrin of Liège—in Campignian fishing stations of the very late Reindeer Period of the north, and again at a time when the moose and reindeer had deserted the station of the Grotte de Martin-Rive, and the stag had replaced the reindeer.

Spread of the Campignian Flint Industry

Whether the log canoe of the Campignian flint worker was an independent western invention, or whether the idea of canoe building came from the East, we cannot be sure; but it may safely be asserted that the flint *tranchet* (prototype of the axe), the flint *pic* (prototype of the pick), possibly the skin-covered *cabane*, and quite probably the log canoe, entered northwestern Europe as new and striking features of this culture period, and that as early as 7000 B.C. the final Stone Age inhabitants of Denmark possessed implements capable of felling a tree and of fashioning a log canoe.

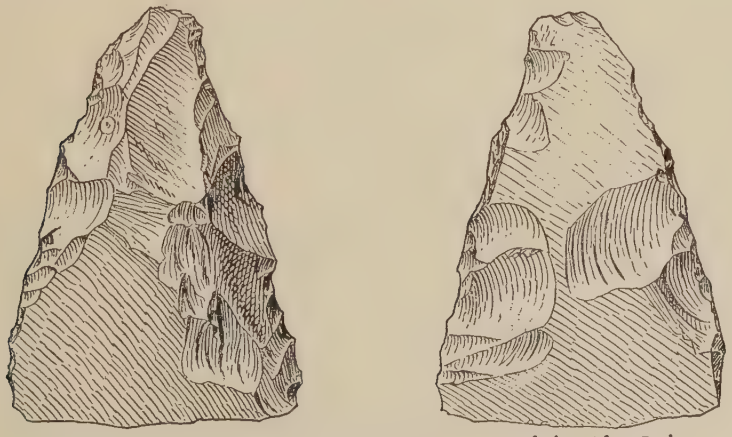


Fig. 54. Tranchet or flint axe from Campigny, France. Actual size. After Capitan.

As regards the effectiveness of stone implements in felling forests and shaping logs, the Danish archaeologist, Friis Johansen, made a convincing test by inserting a flint axe-head in a haft and cutting down a tree with it. It is most probable that the *tranchet* (Fig. 54) was the prototype of the wood chopper and boat builder; the *pic* (Fig. 56) also, inserted in a haft, was useful in shaping the outside and the inside of the primitive log canoe or dugout (Fig. 60), and may have developed into the adze of the more modern boat builder. Like the axe, the *tranchet* has a square head, and its successor, the square-headed *hache*—found only in the forested regions of Scandinavia and northern Germany —is the crude *hache* of the Neolithic Dolmen Period.

A typical seaside dwelling of closing Campignian times in Sweden was that of Limhamn, not far from Malmö and opposite Copenhagen, where we find ourselves in the presence of a fully developed flint industry of the perfected Campignian. Here in abundance are *tranchets* and *pics* fashioned closely after those found in the typical Campignian station, about six hundred thirty miles to the southwest (Figs. 57, 58). Among these flint workers many of the older implements of the upper Stone Age of France are still in use, as, for instance, knives for cutting flesh, arrow points for the chase, scrapers for hide-dressing, borers for the perforation of eyelet holes and the piercing of skin and bone. The arrows and harpoons of bone so abundant in the industry of the Maglemose and Svaerdborg camps in Denmark, which were invented in the Magdalenian of France, are exceedingly rare or have completely disappeared. It is interesting to note that these men still barbed their harpoons with the small Tardenoisian microliths that had

spread from Tardenois, France, all over western Europe. Beside their fireplaces abundant shards of undecorated pottery are found.

The one human achievement which did not follow the reindeer north was that of the Aurignacian and Magdalenian artists and sculptors of the Cro-Magnon race; this art *was left behind because it was not useful or essential to the daily life or food supply of people who were too much occupied with the struggle for existence to develop the aesthetic, or spiritual, side of their nature.* Like the American pioneers these primitive French, Belgian and Scandinavian people had no leisure for art: they were too busy with fishing, hunting, tent making, and boat building. Nevertheless the art spirit was in them, although latent, and we find it reasserting itself about 2000 B.C., as evidenced by most beautiful designs in bronze implements and ornaments made about that time in Scania, the southern extremity of the present Sweden.

The Reindeer Period of Sweden and Denmark

The Reindeer Period of Sweden and Denmark ([12,000?] 10,000–8000 B.C.) was, as shown in the above table (pp. 124-5), long subsequent to the Reindeer Period of southern France. The southern border of the great Scandinavian Glacier had retreated northward, so that the ice front was not far from the present site of Stockholm, which at that time was depressed more than six hundred feet below the present sea level. A small mollusk, *Yoldia arctica*, partial to icy currents, was flourishing along the eastern shores of Scania, and ice-loving seabirds were migrating eastward and westward over Scania and Finland. At this period the Scandinavian peninsula was largely submerged by the sea.

Following their favorite game northward, the hardy hunters of the reindeer invaded this country about 7000 B.C., in the subsequent *Ancylus* time, when the peninsula was elevated and the Baltic Sea was enclosed by land. Their giant flint implements of archaic type remind us of the great stone hand axes of the Old Stone Age, although they are retouched about the borders with the deftness of Solutrean workmanship, the highest technique of the flint industry. Such implements are very rare and are chiefly of amygdaloid (almond-like) form—a form which harks back to the Chellean times of the Neanderthal flint workers on the River Somme of France. According to Montelius these implements are of the same age as, or perhaps a little more recent than, the clubs of reindeer horn from Denmark, which are among the most precious exhibits of the Copenhagen Museum. Two of these have a hollowed groove in which a flint flake was inserted. A single arrow head of flint was also found near one of them.

Fig. 55. Tranchet or flint axe from Svaerdborg, Denmark. Actual size. After Johansen.

The branch of the human race to which these primitive rein-

deer hunters of Sweden belonged has not yet been satisfactorily demonstrated, but in the opinion of Montelius it is quite probable that they were true Scandinavians of Nordic type—a type of which Montelius himself was such a fine example. To quote Montelius freely, the ice began to melt and to retire from the southern coast of Scania more than thirteen thousand years ago (11,500 B.C.), whereupon plants and animals migrated there. After them came man, probably of more than one racial type. Among the more elegant flint implements found in Scania are two closely resembling the double-pointed laurel-leaf type (Fig. 57, lower) characteristic of the Solutrean of France. Such forms occur only near the southern and western coasts of Norway and Sweden, which were the first to become ice-free. In Denmark also a flint spearhead has been found which resembles the Solutrean form.

Montelius was of the opinion that these flints demonstrate the presence of man in Scandinavia during Solutrean times, and he concluded that the reindeer hunters of Scania belonged to the Cro-Magnon race—an opinion which the present author is not inclined to accept, since it seems far more probable that the first reindeer hunters in Scandinavia were fair-haired ancestors of the existing Scandinavian races. It is probable that the first races migrating into Sweden were long-headed, because the earliest human skeletons and skulls well enough preserved to be studied are in the main long-headed or dolichocephalic, the oldest dating back to 3000 B.C. in the chronology of Montelius. In the oldest Scandinavian graves there is no evidence of the occurrence of the broad-cheeked Cro-Magnon type of the late Palaeolithic art age.

In modern Sweden the survey of 1926 recognizes the existence of five greater races: (1) the *Nordic*, (2) the *East Baltic*, (3) the *Mediterranean*, (4) the *Alpine*, (5) the *Dinaric*. Of these we need mention only the *Nordic*, the *Alpine* and the *Mediterranean*, quoting from the findings of this survey:[1]

> The characteristics of the Nordic race are a light, translucent, rosy skin; a fair, sometimes reddish, soft, often wavy or curly hair; a rich beard-growth; clear blue or blue-grey eyes; a tall stature, with proportionately long legs and a firm, elastic gait with stretched legs; a strong frame; a long and rather narrow face with a narrow, usually high, straight, or somewhat bent nose, often with a little hump at the transition from the nasal bone to the cartilage; a narrow, high nasal root; very slightly or not at all prominent cheek-bones; non-salient jaws with the rows of teeth standing nearly vertically, each against the other; somewhat thin lips; a strongly projecting chin; a narrow, somewhat sloping forehead; weak, but quite perceptible eyebrow ridges; rather deepset eyes; a long and rather narrow brain-case with a nearly horizontal crown line and strongly elongated occiput.
>
> The Alpine race (Broca's *race celtique*) is coarsely and clumsily built. It has its name from being especially spread in the mountain regions of Central Europe, above all in Switzerland, North Italy, Central France all the way to Brittany's farthest point, South and Central Germany, part of Austria, Czecho-Slovakia and part of Poland, Russia and many places further south. In the more northern parts of Europe it is more scarce and more diluted. Its spreading area seems to reach all the way to Inner Asia; it has been found as the preponderant element among the Galcha people in the mountain valleys of Pamir and Hindukush. This race has a lighter brownish complexion than the Mediterranean, with thicker, more leathery skin, which with age becomes abundantly wrinkled. Dark brown, rough hair; brown, rather shallow and flat-lying eyes with a comparatively short and narrow slit; a broad, thick-set body; short limbs; a short, broad face with rather prominent cheek-bones and a small uptilted nose; and a broad and rather round brain-case are its chief characteristics.

[1] H. Lundborg and F. J. Linders, Editors: The Racial Characters of the Swedish Nation, pp. 37–41.

The Mediterranean race, as its name implies, is spread about the Mediterranean Sea, as well south as north of it, but likewise partly along the shore of the Atlantic; in a more diluted state even further north, and probably, in a smaller proportion, more or less everywhere. In the East its extent is impossible to define. It seems likely that it plays a great part in the racial mixture of India, Malayasia, and Polynesia. Its complexion is more or less brownish, in the more northerly parts of its spreading area fading off to a warm ivory tinge (as in Ireland), which hardly in all cases can be attributed to a Nordic admixture. The mould of traits is very much the same as that of the Nordic race, but the forehead is smoother and flatter (brow ridges nearly imperceptible) and somewhat steeper. The brain-case is long and narrow, with a strongly developed occiput. The face as well as the brain-case is characterized by a certain soft rounding-off, which gives the Mediterranean a certain finer, more graceful, more delicate character than the harder-moulded Nordic.

The same authority on the Nordics continues:

The Swedes are a very old people, having inhabited their country since times long before the dawn of history. The oldest human find known in Sverige is that of a skull from Stångenäs on the west coast, which is said to be part of a man who lived about eight or nine thousand years ago. It bears a strong resemblance to the Nordic type. We do not, however, know anything about the colours of skin, hair, and eyes of this individual.

Then we must go down to the Lower Neolithic Period, before we find any human remains in this country. But even these are rather few, representing only 77 persons, most of them from Vastergotland: 39 of these skulls (51%) are long, 31 (40%) are medium, and 7 (9%) short. A great many of them do not differ from what at the present time is called the Nordic type. The short skulls, on the other hand, show very strong brow-ridges, broad zygomatic arches, prominent jaws, the lower jaws being coarse and broad, and a top which is very narrow in the center. This is called the *Borreby* type, after Borreby in the Danish isle Sjaelland, where a family or clan of this type seems to have had its burial place during several generations. . . . The finds from the Bronze and the Iron Age do not present any new types, but agree with those from the Stone Age.

The Moose Period in Sweden and Denmark

The reindeer closely followed the ice sheet northward and was succeeded by the moose, which became so abundant in Denmark that it dominated the industrial as well as the hunting life. This was the geologic period (8000–5000 B.C.) known to geologists as the *Ancylus* time, when Scandinavia rose to join Denmark and Finland, shutting out the North Sea and the Arctic Ocean and converting the Baltic Sea into a great fresh-water lake. For archaeologists this *Ancylus* time is characterized by the industry of the Peat Bog (Maglemose) near Mullerup—a name derived from the peat bed in Denmark where a dwelling was discovered and excavated by Sarauw in 1903. Sarauw thought that the people lived on rafts or floats—an error, since it is now known that they dwelt on very low islands or lake borders, a fact brought out in Johansen's description of the neighboring peat station of Svaerdborg.[1]

The fact that we have now left the Reindeer Period and the Old Stone Age of Europe and are witnessing the dawn of the transitional or Mesolithic, leading to the New Stone Age, is clearly established by the absence of any trace of pottery and by the first appearance here of the *tranchet* and the *pic*. Crude as they are, the *tranchet* and the *pic* represent two inventions new to this part of Europe which are destined to be of transcendent importance to the human race, and which relate Maglemose and Svaerdborg (Fig. 53) to the industry of Campigny, France, about five hundred sixty miles to the southwest.

The low coasts of Denmark were ill supplied with native flint, and it is by no means impossible that the few *tran-*

[1] Karl Friis Johansen: En boplads fra den aldste stenalder i Svaerdborg Mose. *Aarborger for nordisk oldkindigbed og bistoire*, 1919.

Fig. 56. THE TRANCHET AND PIC OF THE CAMPIGNIAN STAGE. *A*, *A*-1, *A*-2: both faces and side view of *tranchet* from Campigny. *B*: *pic* from Campigny; prototype of the modern pick-axe. *C*, *C*-1: face and side view of *tranchet* from Sweden; prototype of the modern axe. All 1-2 actual size. Reproduced from specimens in the American Museum of Natural History.

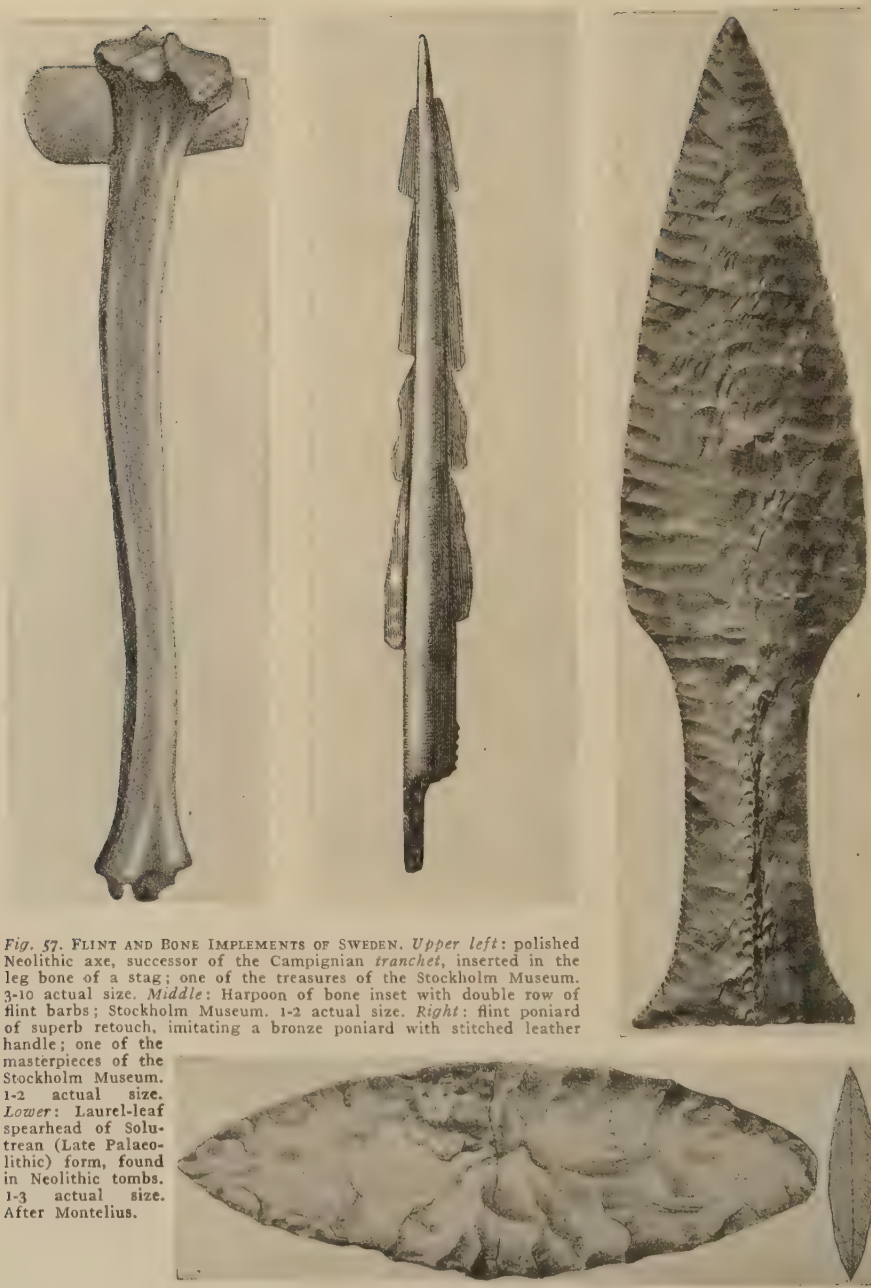


Fig. 57. Flint and Bone Implements of Sweden. *Upper left*: polished Neolithic axe, successor of the Campignian *tranchet*, inserted in the leg bone of a stag; one of the treasures of the Stockholm Museum. 3-10 actual size. *Middle*: Harpoon of bone inset with double row of flint barbs; Stockholm Museum. 1-2 actual size. *Right*: flint poniard of superb retouch, imitating a bronze poniard with stitched leather handle; one of the masterpieces of the Stockholm Museum. 1-2 actual size. *Lower*: Laurel-leaf spearhead of Solutrean (Late Palaeolithic) form, found in Neolithic tombs. 1-3 actual size. After Montelius.

Fig. 58. Tranchet or flint axe from Sweden. Actual size. After Montelius.

chets and *pics* which are found in Denmark may have come by trade from some of the rich flint quarries of Belgium or France in which the Campignian industry had formerly flourished.

The Maglemose and Svaerdborg workers were favored by the abundance of moose, stag, roe, and wild cattle (*Alces machlis*, *Cervus elaphus*, *Cervus capreolus*, *Bos taurus*), which richly compensated them for the paucity of flint. They manufactured bone tools of every kind, especially for their clothing industry —hide dressers, polishers, scrapers—and for the more serious work of the chase they inserted their cutting and piercing flints in bone hafts and handles. A brief survey of the splendid collection from Svaerdborg in the Copenhagen Museum reveals sixteen kinds of bone implements and flint holders, fashioned chiefly from the hard horns of the stag and of the roe, including two kinds of harpoons with a single row of barbs, two kinds of bone lances, and many kinds of hafts. To fashion these bone tools there survived from the earlier Old Stone Age thir-

teen varieties of flint tools—scrapers, points, borers, and hammer-stones—as well as innumerable delicately pointed and dressed flint flakes, which were doubtless set in single or double rows in bone or wooden harpoons, as shown in the illustration (Fig. 57) reproduced from Montelius.

With these numerous survivals of flint implements of the Old Stone Age there appear in Denmark a few examples of the two new forms—*tranchets* and *pics*—and these are by no means well made. We may be sure that these distinctively Campignian implements were not greatly needed by the people of the Svaerdborg and Maglemose region, for they had only just begun to fell the trees, hew the logs, and dig out the log canoes after the manner of the forest-loving, boat-building people of Scania. In Sweden there are a few peat-bog stations of a similar culture with harpoons cut out of the ribs of the moose instead of the stag, and with microlithic flints, probably from dwellings on small islands in the lakes. In Denmark the game associated with this culture included, besides the large ruminants, the wild boar, the brown bear, the beaver, and the wild cat. At all these peat stations only one domestic animal is found—the dog, *Canis familiaris*, harbinger of the art of domesticating animals.

The Succeeding Shell Mound Period of Denmark

The moose has now well nigh disappeared from Denmark and southern Sweden, and with it the pine forests so abundant in Maglemose times; a bird associated with the pine forest, the capercaillie (*Tetrao urogallus*), is no longer included in the fauna. This is the Age of the Stag (5000–3500 B.C.) and the moose is very rare except possibly in the winter season. Climatic conditions are much changed be-

cause we are now in what geologists call the Littorina Period of renewed continental depression. Since the periwinkle (*Littorina*), after which this period is named, is a salt-water mollusc, it is clear that the ocean again entered freely through the straits between Denmark and Scania. The Baltic Sea is entirely cleared of ice, for the great Scandinavian Glacier has retreated within the shore line and is now in the postglacial stage. From the abundant shell mounds of Denmark, placed near the shores of the Littorina Sea, come four species of shells—the oyster (*Ostrea edulis*), cockle (*Cardium edule*), mussel (*Mytilis edulis*), and dog-whelk (*Nassa reticulata*)—besides the edible periwinkle (*Littorina littorea*). The only shell mound discovered in Sweden is of Neolithic age and no shell mound dwellings contemporary with those of Denmark have been found in Sweden, obviously because the inhabitants preferred the game in which the country abounded to the shellfish diet of the Danish tribes to the south. The culture of this shell mound stage is similar to the full Campignian of Belgium and France. The *tranchet* and the *pic* of this time may be compared with the very primitive forms found at Maglemose and Svaerdborg, which in Montelius' chronology are considered from one thousand to two thousand years more ancient.

Each successive industrial period is now marked by the increasing perfection of these two dominant implements, the *tranchet* and the *pic*. If the *tranchet* was used for wood-cutting, the *pic* was used not only for wood-shaping but also for digging—a service which led to the use of the *pic* in mining, the type of tool so applied being made first of flint and later of metal. It seems reasonable to attribute the dawn of boat building and of mining to this latest stage of

the great hunting age of man, when food consisted solely of the flesh of game, fish, or mollusks, and the agricultural fruits of the earth were still unknown in Scania and Denmark, although several thousands of years previous they were developed in Asia. The art of cooking had been improved by the introduction of pottery from the East, and the chase and recovery of game facilitated by the domestication of the dog. Thus closes the transitional or Mesolithic Age.

Divisions of the Neolithic Age in Denmark and Sweden

As we have already seen, the development of prehistoric civilization proceeded very gradually. When our ancestors arrived in Scandinavia, they brought with them an Old Stone Age culture. Then they adopted the *pic* and the *tranchet*—types which in an earlier age were actively manufactured in Belgium and northern France—for Scania was not far from Maglemose in Denmark, where a number of these tools were found. With the arrival of these modified flint tools in the north came also the introduction of the domesticated dog. Similarly, the age of the Shell Mound and of the full Campignian

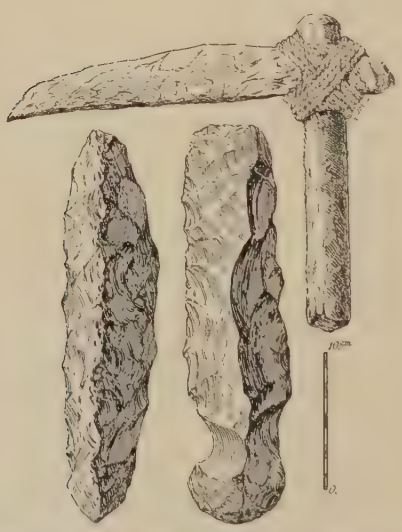


Fig. 59. Miner's Pick from Northern Egypt and Mode of its Attachment. About 3-16 actual size. After Jacques de Morgan.

cultures is gradually marked by the introduction of pottery and of improved types of *tranchet* and *pic*. Finally there came the introduction of the Neolithic art of sharpening the cutting edges of stone implements by rubbing them up and down on a smooth stone.

Thus the *dawn of Neolithic influence in Sweden* is indicated by the polishing of implements of the same kind as those which for thousands of years previous had been fashioned by flaking and chipping. By means of the contact established through trade and by word of mouth with the dark-haired, broad-headed peoples living to the south, stage by stage the Neolithic civilization—for such it was—came north into Sweden. Among domesticated animals appear goats, sheep, cattle, and swine, and finally the horse, which was destined to play a great part in Swedish mythology. Among grains the introduction of the hardy wheat and rye is followed by that of barley and millet. Finally, a wave of religious influence spreads to the north: sun-worship, the idea of immortality, and the pompous ceremonial burials and monuments in honor of the dead.

The main divisions of the progressive Neolithic Period in Sweden, as given to the author by Oscar Montelius in an ever memorable conference on August 5, 1921, and amplified by Dr. Schnittger, assistant antiquarian in the National Museum of Sweden, are, in ascending order, as follows:

IV. NEOLITHIC 2200–1700 B.C.

This is the acme of both the chipped and the polished flint industry. The flint workers learn to imitate both the forms and shapes obtained by the copper and bronze workers to the south and east.

Superb flint daggers are manufactured with a delicate retouch that far surpasses in beauty that obtained in any other part of Europe. The impulse of an artistic spirit is evident in a number of ceremonial

weapons. Among these very finely finished designs in stone are those resembling bronze types—flint daggers in which even the stitching of the leather handles of the bronze weapons is skilfully simulated in flint. All these weapons are doubtless ceremonial.

The battle axes of the period have rather degenerated, and are developed in imitation of the copper types characteristic of Period III. The industrial flint axes retain the same shape as those of Period III—a modified *tranchet* form, thick at the top.

At the same time the elaboration of burial customs begins to be evident. Rectangular stone cists appear—sometimes with a small entrance passage at the gable end. There are also Megalithic burial chambers with an entrance passage, which is always at right angles to the long side of the chamber.

The pottery indicates a marked decadence in design and manufacture.

III. NEOLITHIC 2600–2200 (2100?) B.C.

The stone axes are now smaller in size, thick at the top and expanded at the bottom as if developed out of the *tranchet.*

Excellent pottery is found, resembling that of similar age in Germany and with similar patterns.

II. NEOLITHIC 3000–2600 B.C.

The Scandinavian flint adzes are now very large, finely polished on both sides, and rectangular in section—a type of adze found only in Scandinavia and northern Germany. To this period belongs the adze set in moose horn, one of the treasures of the Stockholm Museum.

The sun-worship cult had by this time reached Scandinavia, and the characteristic burial dolmens of round or rectangular form, but without entrance passage, begin to appear.

I. NEOLITHIC (4000?) 3500–3000 B.C.

Prevalence of polished and unpolished flint adzes, directly developed from the *pic*, convex or concave in section, pointed at the tip and thus not derived from the *tranchet* type.

The new religion of sun-worship had not yet reached Sweden, for there are no Megalithic graves or monuments.

Divisions of the Bronze Age in Denmark and Sweden

During this time trade routes had been established from the southeast Mediterranean region to the northwest. In the Mediterranean islands and the Aegean Sea the most

coveted commodity was amber from the Baltic coasts; in the West and Northwest the most coveted objects were copper and, later, bronze from the East. Many of the actual trade routes have been traced by Montelius until they have become well known to European archaeologists.

To the author, the most striking impression made by the superb collection of prehistoric bronzes in the Stockholm Museum, which he enjoyed observing under the guidance of Montelius, was the surpassing workmanship and the beauty of execution of the fundamental designs which came

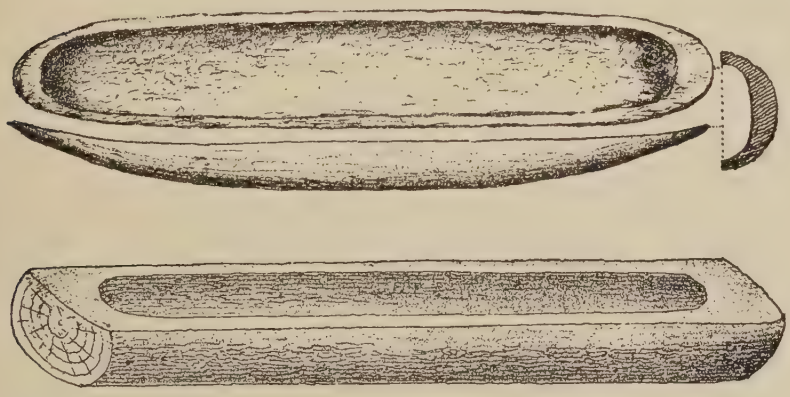


Fig. 60. Prototype of the Viking Ship, hewn with the Campignian *tranchet*. Two designs from Switzerland. After Keller. *Upper*: Top and side views and cross section of log canoe from Robenhausen. *Lower*: Primitive 'dugout' from Möringen.

with the bronze from the distant craftsmen of the eastern Mediterranean to the craftsmen of Scandinavia—from a pure Mediterranean to a pure Nordic race. The most refined methods of bronze casting attained a high degree of perfection among these Nordic workers, in whom the art spirit, which had slumbered so long, was now fully awakened. For example, the method of casting known in France as *à cire perdue*, in which the ornamentation was put on

after the casting, was brought to Scandinavia and was highly developed in the ninth century B.C., about one hundred years before the foundation of Rome. The date of 900 B.C. is established by Montelius through finding these Scandinavian bronzes buried in dated tombs of Italy.

Another achievement of the Swedish craftsmen was the making of collarettes of bronze (Fig. 62) deeply incised in Mediterranean designs by means of bronze tools. Thus Sweden began at an early period to export her works of bronze art, and the facilities of trade advanced so rapidly that Montelius believes that a pottery design could have been carried in one year from the Mediterranean to Scandinavia, one of the favorite routes being by the Brenner Pass, the River Inn, and the valley of the Danube—a route now followed by modern railways. Probably such routes were used for the interchange of objects of industry long before they were used for the transport of objects of art. New religious ideas and ceremonials probably followed the trade routes. Thus, because of the occurrence of Scandinavian burial monuments in Britain, Montelius believed that he had also proved the existence of a route established during the Stone Age, perhaps about 3000 B.C., from Scandinavia across the North Sea to the mouth of the Humber.

PERIOD VI. 700–550 B.C.

Transition to the Age of Iron, which may be called either the last period of the Bronze Age or the first period of the Iron Age.

PERIOD V. 900–700 B.C.

Very thin bronze vessels cast *à cire perdue*, richly decorated, some designs showing the influence of the Mediterranean region. Reversed spirals. Burials with cremation; bones burnt.

Fig. 61. THE FUR-COVERED CABANE. *Upper*: tent of a reindeer koryak of northern Siberia, supported by poles within and covered with reindeer hide. *Lower*: drawings on the walls of the cavern of Font-de-Gaume, France, of Magdalenian age; prototype of the tent above. After Breuil.

Fig. 62. Bronze Bowl and Bronze Collarette, two of the most beautiful objects in the Stockholm Museum, decorated with the incised spiral designs which Montelius believed to be derived from Mycenaean motifs. After Montelius.

PERIOD IV. 1100–900 B.C.

Round, hanging, bronze vessels. Graves, all with cremation.

PERIOD III. 1300–1100 B.C.

Small, round boxes of bronze with star-shaped design. Gold spirals. Necklaces and shawl pins. Graves mostly with incinerated remains.

PERIOD II. 1500–1300 B.C.

High art period of the Scandinavian bronze culture, elegant spiral designs, the workmanship superior to Italian workmanship contemporary with it. Beautiful bronze swords and axes, imitations of bronze axes in stone. The incineration or cremation of bodies in Sweden commenced during this period.

PERIOD I. 1800–1500 B.C.

Mostly simple types, but already displaying remarkable skill in casting, many of them imitating the Stone Age weapons. Evolution of the copper into the bronze axe with increasing economy in the use of this precious alloy of copper and tin. Active trade with England and exchange of axes. Ornamental bronze and gold objects, which are relatively small and rare. Graves with unburnt bodies.

During these six periods bronze was used most sparingly because it had to be imported from other regions, some from the British Isles but the greater part from central Europe. Copper mines were not opened in Sweden until some thousands of years after the end of the Bronze Age, and no tin has been found in Sweden. Perhaps the very rarity of the alloy led to the reverence with which it was regarded and the beauty of design which was developed. Scandinavians were acquainted with only one other imported metal, namely, gold.

Montelius also informs us that during the first part of the Bronze Age bodies were buried unburnt in stone cists or in coffins of hollowed-out oak. From the second to the sixth period the bodies were burnt and the incinerated bones were preserved in small cists of stone or wood, or in simple urns of burnt clay.

Conclusions as to our Scandinavian Ancestors

In closing, let us glance once more at the table (pp. 124-5) in which we have summarized the conclusions of Montelius in regard to the prehistory of Scandinavia from the time when our ancestors arrived in that region to the Age of Bronze, side by side with the geologic chronology of his friend and colleague, De Geer. In this table it becomes apparent that what the far-distant northwest was to our American pioneers, what *ultima Thule* was to ancient historic times, such was Scandinavia to the peoples of the Mediterranean borders. In the course of thousands of years implements, symbols, and inventions—useful, religious, or artistic—slowly found their way westward and northward, from western Asia to Sweden, a distance which, thanks to the telephone, is today spanned in a few seconds. For example, copper is said to have been used at Anau, Turkestan, about 4000 B.C., and first appears in Scandinavia 1500 years later—namely, 2500 B.C. The Age of Bronze, which was in full sway in Egypt and Chaldea by 3000 B.C., makes its first appearance in Sweden eight hundred years later. The rude rock carvings of Sweden tell us much about the life of men in the Bronze Age—of their agriculture, for we see men plowing with oxen; of the chase or war, for we see men on horseback or driving; of navigation, for we see ships without masts or sails but manned with large crews; of religion, for we see the sacred wheel, the symbol of the sun-god.

But for the worship of the sun-god, let us in our next lecture travel southward into Brittany.

V

THE SUN-WORSHIPPERS OF BRITTANY IN THE NEW STONE AND BRONZE AGES

. . . .

No signs they knew to mark the wintry year:
The flower-strewn Spring, and the fruit-laden Summer,
Uncalendared, unregistered, returned—
Till I the difficult art of the stars revealed,
Their risings and their settings.
. . . I fixed the art
Of divination with its various phase
Of dim revealings, making dreams speak truth,
Stray voices, and encounters by the way
Significant; the flight of taloned birds
On right and left I marked—these fraught with ban,
With blissful augury those.
. . . Numbers, too,
I taught them (a most choice device) and how
By marshalled signs to fix their shifting thoughts,
That Memory, mother of Muses, might achieve
Her wondrous works.

—*Aeschylus: Prometheus Bound.*

THE SUN-WORSHIPPERS OF BRITTANY IN THE NEW STONE AND BRONZE AGES

Survivals of Bronze Age tradition — Bretons of the Alpine and Mediterranean races — The environment of the 'Menhirs' and 'Tumuli' — The eastern origin of sun-worship — The circular sun-temples of Carnac and Stonehenge — Ruins of the great tumuli or burial-mounds — The interpretation of Carnac

THE climax of the bronze art in Scandinavia (2000 B.C.) was nearly contemporaneous with the high period of sun-worship in France. Especially in the rocky and impoverished soil of Brittany, was it not natural after the long, hard, cold and foggy winter to welcome the benevolent rays of the sun in the spring and to adopt the mystical sun-worship of the far East?

Stone architecture began to flourish, and giant masses of granite were reared into circular temples open to the sky; across the tops of these stone monoliths were placed horizontal monoliths. Thus was born the idea of the vertical column or pillar and of the horizontal lintel or architrave which appear in rudimentary form in the ancient Minoan temple of Crete. This simple unit of primitive stone construction reappears in the linear close-set monoliths and lintels of the dolmens or tunneled burial vaults. Then followed the decoration of the interior of these dolmens with symbols of the sun, of the harvest or of the stone axe.

With the dead are reverently placed valuable objects of personal adornment and of bronze, more peaceful in symbolism than the implements of the chase which were buried

with the young Neanderthal hunters of 100,000 B.C. Meanwhile, since bronze is extremely scarce, for the ordinary purposes of the prehistoric life of Brittany, particularly for household purposes and for architecture, the New Stone Age implements persist. But the stone axe of Campignian age has now been glorified into the symbol of a thunderbolt; in many of the chimneys of Brittany homes these ancient celts still hang, to ward off the bolts of lightning.

With this introduction let us imagine that we are visiting Brittany and bringing to life northern France in its first great agricultural period of the New Stone and Bronze ages (4000-700 B.C. in northwest Europe but of much earlier date in central Asia).

Survivals of Bronze Age Tradition

On the evening of September 9, 1921, we leave Paris, still the most modern city in the world, and on the following morning before daybreak we begin our narrative in Vannes, a city known before Caesar's time as Gwened, the capital of the Venetes, later the center of that ancient Roman province of Lugdunensis Tertia which was known in Caesar's time as Armorica, and which is now in the heart of Brittany.

As regards architecture, we are back in mediaeval Europe, but a short automobile ride down to Carnac on the coast brings us into an age far more remote, among the ruins of monuments which were in their prime four thousand years ago. The language of the Brittany people is almost as ancient; it is a little island of survivals of the Celtic speech. Yet their psychology is older than either their language or the megalithic ruins; it is the racial psychology of this people

before they were Christianized, while they were still sun-worshippers. But this mystical and reverent spirit renders them all the more devout Catholics.

In the little village of Carnac we realize that we are no more on the mainland; we are insulated, we are among a people very conservative of old customs, loyal to Church and State but very independent, devoted to their locality, very superstitious, tenacious of old customs in dress and language as well as of old ideas. "*Ils sont mystiques*; *ils sont rêveurs*," was the comment of M. Zacharie le Rouzic, the *conservateur* of the delightful little Musée J. Miln of Carnac.

Although Christianized fifteen centuries ago, the Bretons still retain some of the ornaments of the New Stone Age as amulets to ward off the evil eye. Notwithstanding the fact

Fig. 63. Map Showing the Motor Routes and Distances from Vannes through Auray to Carnac and Locmariaquer. Some of the most remarkable monuments are found in the partly sunken islands of the Golfe du Morbihan. The region from Carnac to Locmariaquer is shown more in detail in Fig. 64.

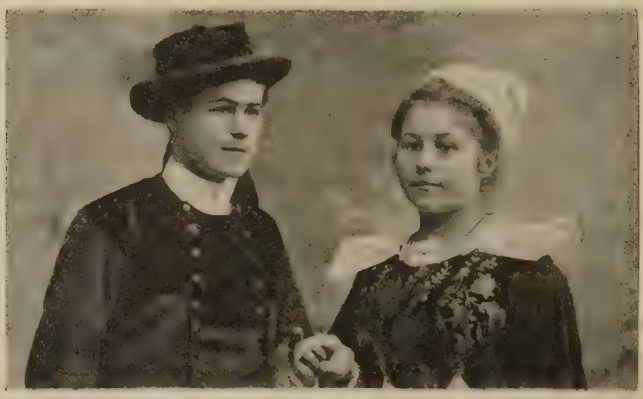
that they are very devout Catholics—for we see them entering and leaving the little church in the village square of Carnac from daybreak onward, thus evidencing their belief that a visit to the house of worship is the proper introduction to the harvest *fête*—they rely not only upon the Virgin Mary but also upon certain ceremonials that are survivals from a religion far more ancient than Christianity itself. Some of these prehistoric rites are supposed to insure a happy marriage, others to render certain that a marriage will be blessed with children, still others to safeguard men and animals from certain complaints and plagues or to produce fertility in cattle. In the chimneys of some of the houses you may still observe fine old stone celts —known now as 'thunder stones' (Fig. 73)—hung up to repel the lightning. An account of some of these survivals of Brittany in the Bronze Age is to be found in M. le Rouzic's very delightful little volume entitled "Carnac—Légendes, Traditions, Coutumes et Contes du Pays."

Fig. 64. THE REGION FROM CARNAC TO LOCMARIAQUER, showing in symbols the sites of monuments, alignments and menhirs. After Edouard Basset.

Fig. 65. Entrance Gate and Courtyard of the Archaeological Museum of Vannes, formerly the Château Gaillard, in which is housed a superb collection from the dolmen burial places of Brittany. Here meets the venerable Société Polymathique du Morbihan, founded in 1826; this society was studying the Neolithic of Brittany while the famous Boucher de Perthes was working in the Palaeolithic Chellean flint implements of the Somme valley.

Fig. 66. Dolmen de Crucuno, near Carnac. The great stones of the burial chamber were arranged in a circle of uprights with a huge slab on top, and the whole was originally covered by a great tumulus or mound of earth.

ALPINE TYPES OF QUIMPER — A NEWLY WED COUPLE



A COUPLE FROM BANNALEC, OF ALPINE (LEFT) AND NORDIC OR NORMAN TYPE (RIGHT)

A COUPLE FROM SCAËR, OF ALPINE (LEFT) AND ALPINE - MEDITERRANEAN TYPE (RIGHT)

Fig. 67. THE THREE RACIAL TYPES OF MODERN BRITTANY. Three young married couples in characteristic native costumes as they appear at Breton fêtes. The author was fortunate enough to witness the harvest festival at Carnac on Sunday, September 11, 1921.

Bretons of the Alpine and Mediterranean Races

On the physical environment and geographic origin of these Bretons, Ripley may be quoted:[1]

"Brittany or Armorica, the third area of isolation, is perhaps somewhat less unattractive economically than Auvergne. It is certainly less rugged. Extending in as far as the cities of Angers and Alençon, it is saved from the extreme infertility of its primitive rock formation by the moisture of its climate. Neither volcanic, as are many parts of Auvergne, nor elevated—seldom rising above fourteen hundred feet—it corresponds to our own New England. For the farmer, it is more suited to the cultivation of Puritan religious propensities than to products of a more material kind. It is the least capable of defence of the three areas of isolation; but it redeems its reputation by its peninsular position. It is off the main line. It is its remoteness from the pathways of invasion by land which has been its ethnic salvation.

"The Alpine broad-headed type . . . is always and everywhere aggregated in the areas of isolation. Its relative purity, moreover, varies in proportion to the degree of such isolation enjoyed, or endured if you please. In Savoy and Auvergne it is quite unmixed; in Brittany only a few vestiges of it remain, as we shall soon see.

"The whole basin of the Seine was overflowed, and the incoming human tide swept clear out to the point of Brittany, where it has so completely held its own even to this day in relative purity. Topinard perhaps slightly overstates the case when he ascribes the cast of eyes among certain Breton types to an Asiatic descent.

[1] W. Z. Ripley: The Races of Europe, A Sociological Study.

"The anthropological fate of Brittany, this last of our three main areas of isolation, depends largely upon its peninsular form. Its frontage of seacoast and its many harbors have rendered it peculiarly liable to invasion from the sea; while at the same time it has been protected on the east by its remoteness from the economic and political centers and highways of France. This coincidence and not a greater purity of blood has preserved its Celtic speech. . . . The contrast has arisen between the seacoast and the interior. This differentiation is heightened by the relative infertility of the interior uplands, compared with the '*ceinture dorée*' along parts of the coast. The people of the inland villages contain a goodly proportion of the Alpine stock; although, as our maps show, it is more attenuated than in either Savoy or Auvergne. To the eye this Alpine lineage in the pure Breton appears in a roundness of the face, a concave nose in profile, and broad nostrils. Along the coast intermixture has narrowed the heads, lightened the complexion, and, perhaps more than all, increased the stature."

The most ancient ethnic element in the population of Brittany is the broad-headed, gray-eyed northern Alpines, short of stature, quite Irish in appearance, but without the excitable Irish temperament. There is a considerable Mediterranean element, narrow-faced, dark-haired, dark-eyed, with aquiline features—people who came perhaps by sea from the shores of the Mediterranean. Here and there, constituting less than one-tenth of the population, is also the Normandy or Nordic racial type, blue-eyed, fair-haired, with brown or sandy beard.

Race mixture came not from the interior but by the sea. The dark-eyed Mediterranean sailors and the fair-haired Saxon navigators skirted the whole coast—the largest

Saxon colony was, in fact, around the Golfe du Morbihan; this is inferred from certain indications in the Breton peasantry of a blond cross in early prehistoric times. But the prevailing complexion is medium, the stature is short, and the face is either of the broad Alpine type or of the narrow Mediterranean type, or else of a blend between the Alpine and the Nordic (blond type of Normandy). Certainly the prevailing color of the hair is dark; this is either Alpine or Mediterranean—blonds are very exceptional. The prevailing form of the face is broad; this is indicative of the Alpine. There are, however, many oval faces, which represent a blend between the broad-faced Alpine and the narrow-faced Mediterranean. The prevailing complexion is of the lighter Alpine type rather than of the olive Mediterranean type.

Conducive to racial isolation and psychical insulation is the fact that this part of the coast has no deep harbors and does not admit of modern commerce. Some far-distant day, perhaps, we shall have deeper harbors here, for the seacoast is now sinking and some of the most interesting of the old monuments are to be seen only at low tide or even beneath the surface of the sea. Another outstanding feature of the Brittany environment is the infertility and scantiness of the soil. Stones are found everywhere—all of enduring granite. After the long, overcast winters, spring is trebly welcome. As the sun begins to rise earlier and earlier, the days become warmer and longer, and seedlings sprout from the soil; finally the summer solstice is reached and the peasants rejoice, as their ancestors did four thousand years ago, in the earliest sunrise and the latest sunset of the year.

The Environment of the 'Menhirs' and 'Tumuli'

Only by seeing this natural environment, studying this people and their racial blending, and realizing that many of the Brittany customs have probably been handed down from the time when they were first introduced, about 4000 B.C., can we grasp the significance of the megalithic monuments which have made Carnac the most famous center in all France of the period of sun-worship which extended from the climax of Neolithic or New Stone Age culture to the beginning of the Bronze Age. Unfortunately, few archaeologists have interested themselves in the matter of race mixture, but Déchelette observes: "On doit admettre chez les peuples qui ont élevé les monuments mégalithiques une certaine communauté de culture, mais nullement une communauté de race." This is certainly true if applied to the building of the megalithic monuments in general, but it is not true of the erection of the monuments of Brittany, which were the work primarily of people of Alpine origin, among whom the arts of the engineer and the miner arose.

The finest of these monuments surround the Golfe du Morbihan. They attest the greatest faith in sun-worship as well as the most stupendous labor and engineering skill in piling up the monuments to the dead. They bear weighty testimony to the spiritual life of these people, showing that their faith in the future life of their honored chieftains prompted them to carry to completion these really titanic mechanical undertakings involving the transportation and erection of great monolithic menhirs. To some extent these menhirs suggest the obelisks of Egypt, while the tumuli suggest the pyramids, and the dolmens—consisting of two erect stones and one horizontal stone at the top—suggest the fundamental architectural units of the Egyptian temples.

Fig. 68. The Island of Gavr'Inis in the Golfe du Morbihan near Locmariaquer, surmounted by its tumulus, within which is the most famous gallery in France, with the ornamented stones shown in Fig. 70.

Fig. 69. The Grand Menhir of Locmariaquer, the largest menhir known. Before it fell and broke it was more than sixty-seven feet high. In the foreground are the tablets indicating that this is a national monument. Photograph by courtesy of V. Forbin.

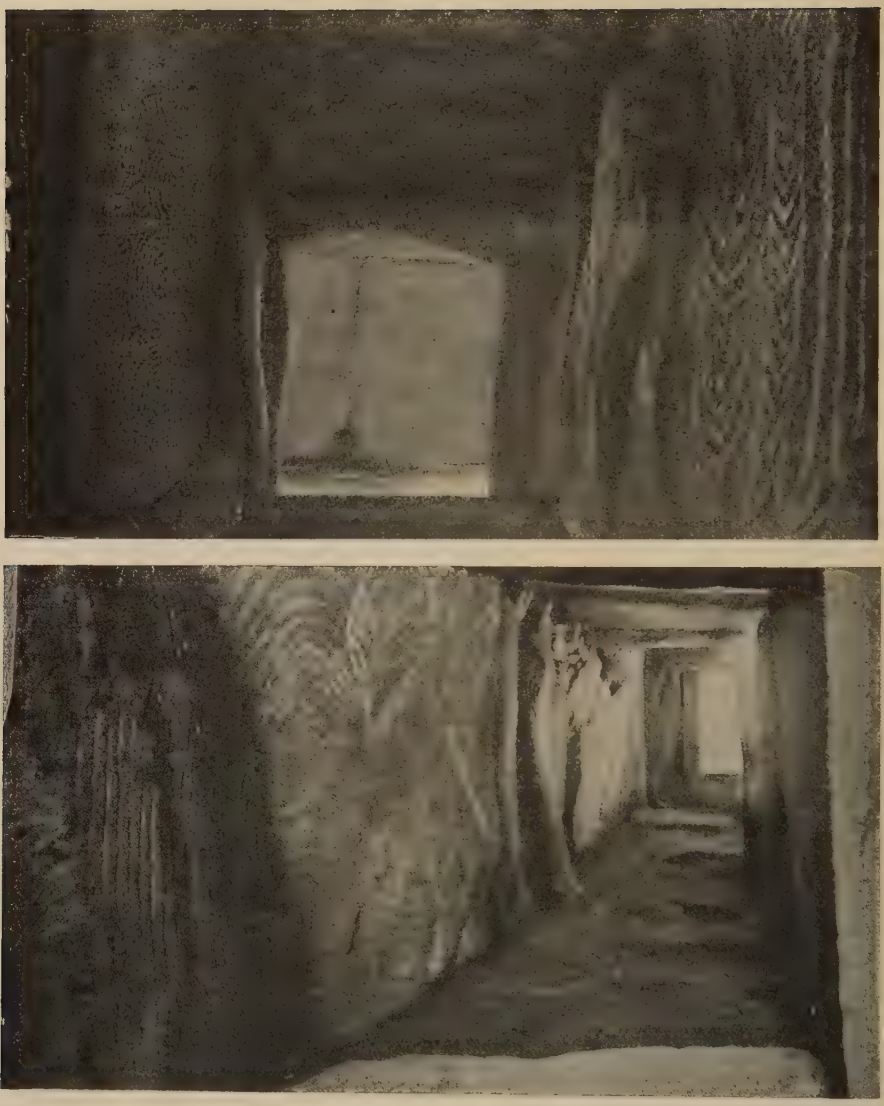


Fig. 70. THE SUPERE GALERIE DE GAVR'INIS. The gallery entrance, still buried within the tumulus of Gavr'Inis, is the finest in Europe, both in respect to its perfect preservation from vandalism and to the sinuous, multilinear decorations which are graved on the inner faces of all the great stones lining the gallery. The interpretation of these designs is fully discussed in "Les Petroglyphes de Gavr'Inis," *L'Anthropologie*, June, 1921, by Dr. E. Stockis, who regards them as derived from the intricate lineation of the finger-tips and palms of the human hand. By Le Rouzic and the present author they are regarded as a complex development of the wheat field pattern seen in Fig. 72.

We asked M. Louis Marsille, the genial *conservateur* of the Museum of Vannes, and M. le Rouzic to give us their views of the chronology of the period and the succession of cultures. Notes made of their statements form the basis of the following table, in which we observe the gradual development of the dolmens into the period of their grandeur and of their subsequent decadence, followed by the post-dolmen period which passes into the second stage of the Age of Bronze and that in turn into the Age of Iron.

SUCCESSION OF PEOPLES AND OF STONE AND METAL CULTURES IN BRITTANY

AGE OF IRON	
Circular burial tombs	
AGE OF BRONZE—Stage II	
Incineration and interment of the dead	Vases of graceful design Lance points in bronze
AGE OF BRONZE—Stage I	
Tombs buried beneath tumuli	Poniard of bronze (rare) and of copper (more frequent); superb flint arrow points
NEOLITHIC—Stage III	
Decadence of dolmens—their walls of large stones or of dry masonry. No entrance passage. Burials to protect the dead. Cists quite frequent. Skeletons are placed in crouching position (*accroupi*). Beginnings of incineration	Fine stone axes; a little pottery; bronze (rare) Arrow points of flint
NEOLITHIC—Stage II	
Large dolmens with long passage entrance, built of very large stones. Cists with human remains of long-headed (dolichocephalic) type	Ceremonial *haches*, finely polished; hammers; necklaces of jadeite; gold (rare)
NEOLITHIC—Stage I	
Dolmens—small, built of small stones with no covered passage entrance. Cists. Human remains of broad-headed (brachycephalic) type	Pottery; implements of coarse workmanship which had been used previously and then buried with the dead

TABLE VIII

It would appear that during the Age of Polished Stone (Neolithic) and the Age of Bronze the civilization of this region was not more isolated than it is at present. With the introduction of agriculture came sun-worship from the East—perhaps from as far east as the Iranian plateau. With it doubtless came the tools used in preparing the soil, the seeds needed for sowing the crops, and the implements required in harvesting the grain. For thousands of years the ancestors of these people had observed the response of the seeds to the sun and of the moistened soil to the genial action of the sun's rays. The agricultural bent of their mind is beautifully illustrated in their decorative motifs, the key to which appears to be afforded in the graved stones that line the tumulus of *L'Ile de Gavr'-Inis*, certainly the most interesting island in the Golfe du Morbihan (Fig. 68), described as "*le plus beau monument mégalithique*" in the entire world.

The long gallery of Gavr'Inis (Fig. 70) is still deeply buried in the heart of the tumulus and perfectly preserved. It is constructed on the unit principle of architecture found in the simplest dolmens, namely, two vertical stones with a broad horizontal stone on top, archetypes, as we have said, of the column and of the architrave of the Egyptian temple. The decoration of the sides, laboriously cut with the hardened bronze tools of the period, consists of long, equidistant engraved lines either arched, undulating, or coiled in spirals. The spiral coil has suggested to a recent writer that these are titanic finger prints—a sort of Neolithic Bertillon system—perhaps the finger prints of the sun-god; but such an interpretation must be considered fantastic in the extreme. The equidistant lines between these grooves correspond to the symmetrically spaced

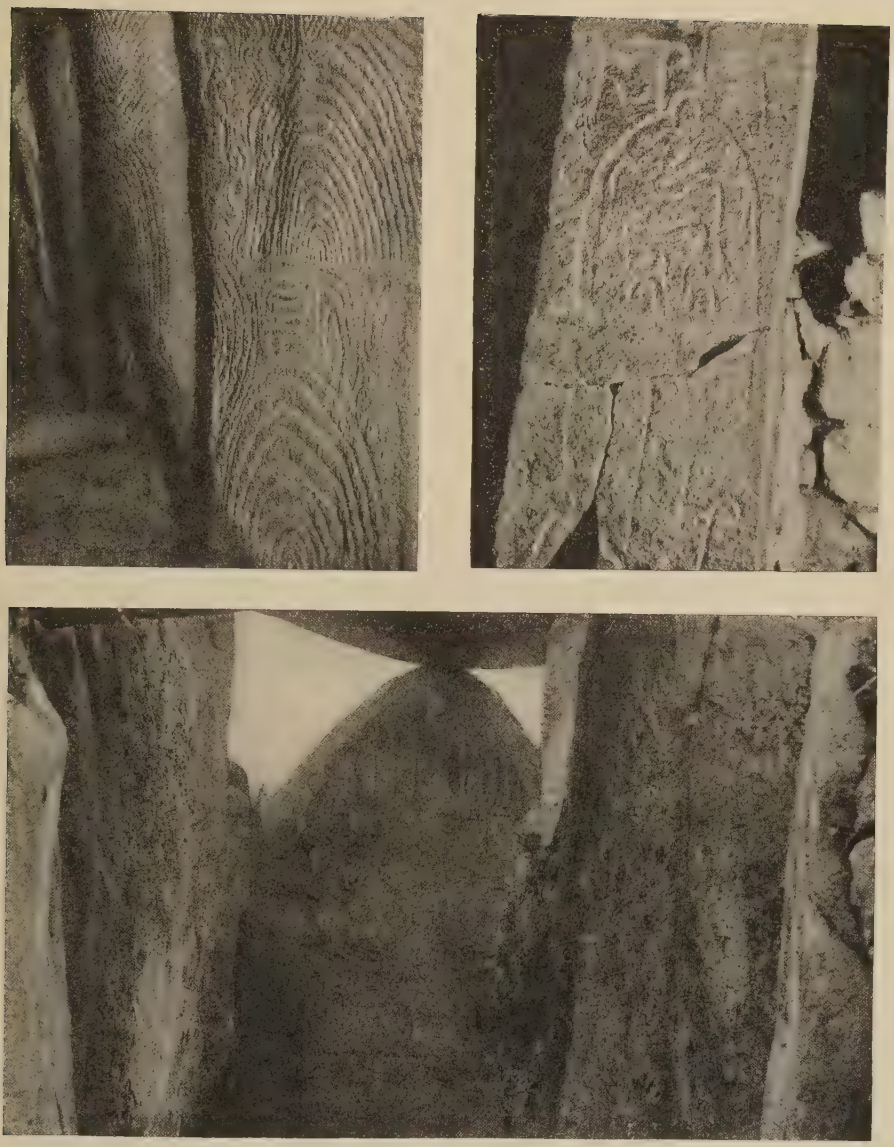


Fig. 71. ENGRAVED STONES WITHIN THE DOLMENS. *Upper left*: vertical stones of the side walls of the *galerie* of Gavr'Inis. *Upper right*: within the tumulus of Mané-er-H'roëk, this engraving attempts animal symbolism (above) and a crude representation of a ceremonial axe (below). *Lower*: triangular stone beneath the Table des Marchands, on which is engraved the wheat design shown in Fig. 72.

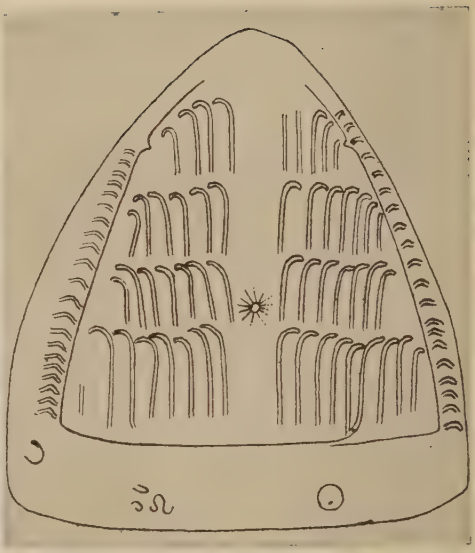


Fig. 72. THE WHEAT DESIGN, with the representation of the sun in the center, on the triangular stone of the Table des Marchands (Fig. 71, *lower*). At right, (*upper*) key to this design as interpreted by Zacharie le Rouzie and Charles Keller; (*lower*) two clusters of seven wheat stalks each, from the fields of Brittany.

Fig. 73. (*lower left*) INCISED SYMBOL OF THE HACHE OR BATTLE-AXE OF THE BRONZE AGE. The *hache* is seen to be the direct model of the *tranchet* (Fig. 54) of the previous Campignian period.

stalks of rye or of wheat. The interpretation of these designs appears to be supplied by a design carved on one of the stones supporting the great Table des Marchands (Figs. 71, 72). It shows four rows of single stalks of wheat —with a representation of the sun in the center—bowing their heads like the sheaves of wheat in the story of Joseph.

In the opinion of M. le Rouzic and M. Louis Siret this great boulder of granite was cut during the late Stone Age. M. Siret is quoted by M. le Rouzic as follows:

> Le polissage n'est pas le dernier perfectionnement du travail de la pierre. Les plus anciens outils polis ne sont pas en silex, mais en roches telles que la diorite et la fibrolithe qui n'étaient pas employées avant l'application du polissage. La taille du silex s'est au contraire faite par éclatement pendant la majeure partie de l'âge de la pierre polie. Le procédé du polissage est exclusivement employé à un genre d'instruments répondant à des besoins d'un ordre nouveau, formant un attirail nouveau, indépendant de celui en silex, autant par les formes que par le procédé. En un mot, la pierre polie est un témoin de l'avènement de l'agriculture; les instruments qui l'accompagnent sont créés pour la construction de maisons, de dépôts, d'appareils divers pour l'agriculture et les industries nouvelles, et impliquent un usage très fréquent du bois. La hache polie n'est pas un symbole de la guerre, c'est celui de la civilization nouvelle, que résume l'agriculture.[1]

This design of the grain field is apparently unique, although a design in the tumulus of Gavr'Inis may possibly be a conventionalized variant. We can imagine the labor involved in cutting these patterns even with the hardest implements of polished stone, and also the strong religious and artistic impulses which inspired this labor. These people not only had a vision but they had tremendous will power, as manifested in the execution of these difficult designs, not to mention a knowledge of the mechanical appliances necessary to transport the titanic megaliths. Doubtless the work was directed by priests and the la-

[1] L. Siret: Orientaux et Occidentaux en Espagne.

borers were commanded by chieftains, but great numbers of people must have responded with a will that felt the urge of an indomitable spiritual and ethical purpose.

The Eastern Origin of Sun-Worship

Only by viewing these giant stones and this infertile country can we appreciate how the energy which drew crops from the reluctant soil was turned with corresponding fervor to the purposes of religion and of architecture, resulting in crude but grandly conceived monuments of worship and of burial. Mute witnesses to the powerful appeal made by this religion of the sun extend across the great continent of Eurasia, for the monuments are found from Korea westward to the remote parts of Brittany.

From the Alpine race, central or west Asiatic, which was the chief disseminator of the art of agriculture and of the religion of sun-worship, these ideas were spread to the Mediterranean race in the south and to the Nordic races in the north. It is believed by many archaeologists that the megalithic funereal monuments were introduced by the Mediterranean race; if so, they were first erected not by the Alpines but by the long-headed Mediterraneans. This combination of the cult of the megaliths and of sun-worship in the interests of agriculture was very widespread, and may have been the contribution of more than one race. The megaliths in the south of France date from the beginning of the Bronze Age, namely, about 2000 B.C. as attested by the occurrence of bronze weapons and tools in the interments. In the north of Europe bronze was very rare and very costly; it came from a long distance both to Brittany and to Scandinavia. The stone-cutters of the period were forced to use tools of the hardest kind of stone.

THE SUN-WORSHIPPERS OF BRITTANY

At the climax of the megalithic period of Brittany, characterized by great tumuli with the dolmens within and by long entrance galleries like those of Gavr'Inis, these people reached the height of their sun-worship civilization, which was contemporaneous with the highest development of their inner spiritual forces, the source of which is so mysterious.

The Circular Sun-Temples of Carnac and Stonehenge

Near Carnac are two great ceremonial centers consisting of circles of stone known to the Bretons as *cromlechs*, from which extend outwards long lines of stones called by the Bretons *alignements*. These are the famous *Alignements de Carnac* (Fig. 74). It is in the cromlech that we find a close parallel to the most famous circle of all—Stonehenge (Fig. 77) on the Salisbury Plain, England, the astronomic significance of which has been studied by Sir Norman Lockyer, who calculated that on midsummer day June 21, 1680 B.C., the sun must have risen exactly over the spot now

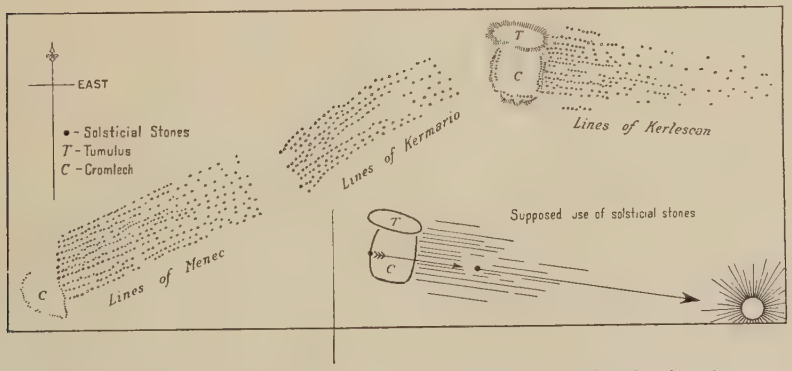


Fig. 74. KEY TO THE THREE BEST-PRESERVED ALIGNMENTS OF CARNAC, after drawings in James Ferguson's "Rude Stone Monuments" (1872. Each alignment has its *cromlech* (C), or sacred circle, from which the lines extend a great distance. Menec has ten (eleven) rudely parallel rows of menhirs (Fig. 75); Kermario has ten, and Kerlescan has thirteen. M. le Rouzic points out that solsticial stones are sometimes placed between two lines and within the *cromlech*.

occupied by a modern benchmark on Sidbury Hill, eight miles northeast of Stonehenge and in a direct line with the center of the circle. Lockyer calculated that this was the date of the erection of Stonehenge monument, with a margin of error of two hundred years, namely, from 1680–1880 B.C. The latter date is the more probable, for from collateral evidence in Brittany the year 2000 B.C. marks the close of the Neolithic—the period of splendid polished *haches* of jadeite, a period when bronze was in full use along the Mediterranean trade routes with which Brittany was only in distant connection.

As with Stonehenge, each cromlech of Carnac has its solsticial line, and this is especially apparent because at some distance from the circle stands the more or less permanent solsticial stone *between* the alignments and not a part of them. The direction of the seven or eight lines of great parallel stones is *eastward* or *southeastward* from the cromlech. This is also the direction of the gallery which extends from the central burial chamber within the tumulus. Thus the body of the chieftain, buried with all the ceremonial axes or celts, reposed in a chamber connecting with a gallery which faced the rising sun.

Ruins of the Great Tumuli or Burial Mounds

Unless you visit this country, it is difficult to realize that each dolmen is the vestigial stone skeleton of a tumulus of earth. It would appear that originally the dolmens were built laboriously of stone, and then laboriously covered with earth; that the entrance galleries were regarded with reverence; that the traditions of the great chieftains and families in whose honor they were erected lasted for a long period; and that finally these traditions passed away.

There were two causes of destruction. First, the earth of the tumulus was removed and returned to the farms by the thrifty agriculturists, for we can imagine how the country, poor in soil, became impoverished by the building of the great earth tumuli. Thus every dolmen that was once earth-covered is now entirely bare.

The second cause of destruction was the rifling of the tombs when it was discovered that articles of bronze and of the more precious gold were sometimes to be found in them. This kind of destruction, which was similar to that which ruined so many of the finest monuments of Egypt, also extended over a long period of time. Hundreds of valuable implements were scattered over the country to serve as 'thunder stones' in warding off the evils of lightning, and it was only with the foundation of the Société Polymathique du Morbihan that these relics of the archaeologic history of France began to be collected and preserved.

More fortunate were the dolmens of a later period, when the custom of covering them with small stones was instituted. The tumuli of such dolmens have been preserved—there was naturally no advantage in returning these stones to the ground in a country which is as full of scattered stones and boulders as any part of New England.

An instance of the first cause of destruction are the three dolmens with *allées couvertes* of Mané Kerioned, in which the covering soil has been completely removed—dolmens representing the best period of the Neolithic before the Bronze Age. Here two of the *allées couvertes* point toward the south; the third points toward the north—perhaps the grave of a sceptic in the matter of sun-worship. In Celtic the names of these burial sites signify respectively mountain of the fairies, mountain of the gnomes, mountain of

the black elves, who were believed by the ancient Bretons to have built the tombs.

Another group of dolmens from which all the earth has been removed is that of Rondesec, beautifully situated on a mound overlooking the Bay of Quiberon; here each *allée couverte* points directly southeast, doubtless the very direction devout sun-worshippers would choose. The family here buried was prosperous, too, for the excavation of 1848 led to the discovery of two gold armlets—a discovery which prompted the spoliation of many other dolmens in search of treasure.

1832[1]	Gavr'Inis—tumulus	Beautiful gallery, no implements
1849	Rondesec—tumulus	Two armlets of gold
1853	Tumiac—tumulus	Thirty-two superb ceremonial axes, three necklaces of callaïs
1862	Mont Saint-Michel, Carnac—tumulus	Thirty-nine ceremonial axes, two necklaces
1863	Mané-er-H'roëk—tumulus	An oval ring of jadeite encircling a polished ceremonial axe of chloromelanite, also 101 celts or polished axes, all purposely broken
1863–1864	Mané-Lud—tumulus	The burial chamber exceptional in containing seven heads of horses in a beautifully constructed tumulus. In 1911 M. le Rouzic found a necklace of callaïs and five small bands of gold
1863	Kercado—tumulus	Two ceremonial axes, ornamented pottery, and a few beads of callaïs
1864	Le Moustoir—tumulus	Pottery, flint flakes from the famous quarry of Grand Pressigny, and beads of callaïs

TABLE IX

Gold was found also in the very large tumulus of Mané Lud (Mount of Cinders), excavated in 1863; here a number of the chieftain's horses had been sacrificed and the heads placed in a crescentic line near the crypt. The crypt itself

[1]The dates of the successive exploration of these dolmens, indicated in the table above, were kindly given to the author by M. le Rouzic.

Fig. 75. ALIGNEMENTS DU MENEC, CARNAC. Here there are ten (eleven) lines; many of the stones of its *cromlech* have been removed to build farmhouses and walls. Photograph, by courtesy of V. Forbin, taken from the edge of the circular *cromlech* looking eastward.

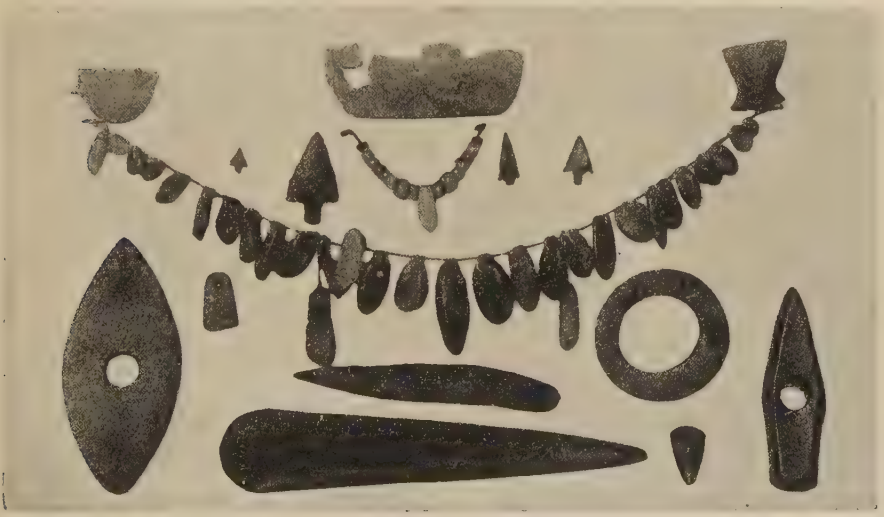


Fig. 76. CEREMONIAL AND ORNAMENTAL OBJECTS FROM THE DOLMENS NEAR CARNAC, now preserved in the Musée J. Miln at Carnac, including (*lower*) large, polished ceremonial axes, some of which are of chloromelanite and jadeite; rings of jadeite; (*center*) necklace beads and pendants of callaïs, quartz and agate; arrowheads of unpolished flint.

Fig. 77. GIANT CROMLECH, or stone circle temple of sun-worship, Stonehenge, Salisbury Plain, England.

was filled with incinerated bones, indicating a period when cremation was customary; this incineration is referred to in the name of Mané Lud.

Mané-er-H'roëk (Mountain of the Fairies) is one of five virgin tumuli found undisturbed, the others being Tumiac, Mont Saint-Michel, Kercado, and Le Moustoir. Mané-er-H'roëk is a round tumulus built entirely of stone, doubtless in honor of a very great chieftain. The superb collection of ceremonial objects discovered here is the finest of the period which has been found in France. It includes nearly two hundred pieces, all of the finest Neolithic workmanship, in polished jadeite, chloromelanite, fibrolite, and callaïs.[1] The necklace beads are of callaïs, quartz, and agate, with not a single object in bronze and only a few fragments of flint. It represents the acme of the Neolithic period in industry and art. While there is no bronze in the ceremonial burial, the form of some of the celts, or axes, recalls bronze both in shape and in design. The splendid necklace and the very large pendants of callaïs were probably assembled from local quarries found in the Archaean mica schists. Most of the celts were intentionally broken but some of the best were left intact, including the one of chloromelanite encircled by a jadeite ring listed in the table opposite (p. 178), which is said to be the finest in France.

The second undisturbed tumulus is Mont Saint-Michel, Carnac, a veritable mountain of rock, within which the galleries are lined with small tombs. These have been further investigated, from time to time, since the original

[1] Callaïs is a precious stone of unknown source, closely approaching turquoise in its chemical composition. but containing a somewhat smaller proportion of aluminum. It is translucent, and apple or emerald green in color. More than 450 beads and several pendants of this substance have been found in the dolmens of Morbihan, while in the other departments of Brittany it is almost unknown. Similar beads have been found in Provence, in the Hautes-Pyrénées, and in Portugal.

discovery in 1862 by M. René Galles, who unearthed numerous celts and a beautiful necklace, or *collier*, of callaïs ornaments. Of the thirty-seven *haches* the seven largest weapons were purposely broken; the others remained intact. Kercado, another of the undestroyed tumuli, has a circle of large stones outside the stone mound, which no doubt had some religious or mystic significance. The most recent of the untouched tumuli to be exposed was Le Moustoir, Carnac, which contained none of the large *haches* but has yielded giant flint flakes, evidently brought from the famous flint mine of Grand Pressigny, and also well-shaped vases with their supports.

Tumiac, the first of the undisturbed tumuli to be explored was opened in 1853. It is of about the same age as Mont Saint-Michel, as demonstrated by its closed dolmen chamber, but it lacks the entrance gallery and thus belongs to the decadent period of the tumuli. Although inferior in size to Mont Saint-Michel, Tumiac is 345 feet long and was the burial place of twelve individuals, probably members of one great family. The excavations here yielded thirty-nine fine *haches*, examples of the best Neolithic workmanship.

It is noteworthy that in all the tumuli bronze is very rare, although Kercado belongs in the Bronze Age.

The Interpretation of Carnac

M. le Rouzic regards Carnac as a great cemetery of late Neolithic times, where the chiefs were brought for burial, the most frequent symbol being the *hache* of the chieftain, an example of which is shown in Figure 73. As bearing upon sun-worship, M. le Rouzic points out that the symbol of the life-giving sun is rather rare, while the symbol of the

wheat is relatively frequent. He inclines to interpret the sinuous lines of the stones of Gavr'Inis as conventionalized designs symbolic of the wheat field. He also inclines to see traces of remote Egyptian or Phoenician or proto-Phoenician influence, or of still more remote Mycenaean influence in the dome-like burial chamber of Isle Longue, where the only semblance of the surviving dolmen influence is the long *galerie couverte* facing toward the sun, and the large circle of upright flat stones around the base. Above the base is a dome-like construction of small stones introducing the entirely new structural principle of the arch. This work, M. le Rouzic informed us, is attributable to the first Age of Bronze.

M. le Rouzic, *conservateur* of the Musée J. Miln, our genial host during the three days' study of Carnac and visit to the island tumuli of the Golfe du Morbihan, pointed out to us the racial succession indicated first by the predominance of round-heads, whom we regard as members of the Alpine race that dominated Armorica at the close of Neolithic time (2000 B.C.), which corresponds to the Bronze Age elsewhere. Following the stately and costly burials of the round-heads came other interment customs with an invasion of long-heads, who laid out their dead in straightened form in the cists or stone coffins—rude prototypes of the monolithic stone sarcophagi of Greece and Rome. The straightened bodies of the cist burials are in striking contrast to the generally flexed bodies of the dolmen burials.

M. Marsille was enthusiastic over the intelligence of the men of the dolmen period—they understood all the minerals, how to procure them and how to shape them, and they sought out the rarest. We shared this enthusiasm of

M. Marsille, and it was with regret that we ended our three-day Neolithic tour, wherein we received striking impressions of Brittany as it was four thousand years ago and gained historically a clear vista of the mysterious region of prehistory where one has to grope about for knowledge and where again the constructive imagination and genius of French archaeology command our admiration.

VI

THE FIRST STEPS TO PARNASSUS IN CENTRAL ASIA

For what is man? behold!
Can he requite thy love—child of a day—
Or help thy extreme need? Hast thou not seen
The blind and aimless strivings,
The barren blank endeavour,
The pithless deeds, of the fleeting dreamlike race?
Never, O nevermore,
May mortal wit Jove's ordered plan deceive.

. . . . . .

What land is this?—what race of mortals
Owns this desert? who art thou,
Rock-bound with these wintry fetters,
And for what crime tortured thus?
Worn and weary with far travel,
Tell me where my feet have borne me!
. . . Ah wretched me!
Wandering, still wandering o'er wide Earth, and driven
Where? where? O tell me where?

—*Aeschylus: Prometheus Bound.*

THE FIRST STEPS TO PARNASSUS IN CENTRAL ASIA

The west European theory of human origin — The north Asiatic theory — The central Asiatic theory — Why Mongolia may be the home of primitive man — The undiscovered Dawn Man of central Asia — Andrews strengthens the central Asiatic theory of human origin — The racial problem before the time of Darwin — The three primary human stocks or super-races — The three primary races of Europe — Causes of the divergence of races, species and stocks — The influence of posture on the human skeleton — The amphibious life of the primitive Hawaiians — How to produce an arboreal type of man — How a secondary race of squatting men might be produced — The future rise of man

IN the four preceding lectures we have been observing the men of the Dawn and Old Stone ages as they are found in Great Britain and in western Europe. In these regions their industries and arts are so ancient that some distinguished students of archaeology and anthropology have concluded that western Europe was the homeland in which the Stone Age Man arose from a more primitive condition.

Because of the Biblical narrative and because European knowledge extended barely beyond the confines of Asia Minor, Palestine, Syria and Mesopotamia, the traditional or non-scientific homeland of man is western Asia. As to eastern thought on this great subject, we are assured that the Chinese believed that they sprang from their own soil, and as for the south Asiatics, they concerned themselves little about the geography of human origin.

The most recent discoveries tend to support the older theories of human origin in Asia. Let us therefore review the history of opinion as to our homeland, opinion swaying

as it were backward and forward between Asia and Europe. While urging caution against hasty inferences, the author prophesies that *the still undiscovered Dawn Man described in the second lecture will be found in the high Asiatic plateau region and not in the forested lowlands of Asia*, but many decades may ensue before this prophecy is either verified or disproved.

The West European Theory of Human Origin

In the year 1887, the discovery of two Neanderthaloid skeletons at Spy, near Dinant, Belgium, confirmed the authenticity of the fossil Neanderthal race of man and opened the way for a succession of discoveries of fossil human remains which repeopled the whole of western Europe with various races, species, and perhaps genera of primitive man, thereby accumulating *fossil evidence strongly in favor of western Europe as a center of human dispersal.*

Between the years 1823 and 1925 there were discovered in western Europe the remains of no less than 116 individuals belonging to the Old Stone and Dawn Stone ages, namely: two individuals of the Piltdown race; forty individuals of the low-browed Neanderthal races of Heidelberg, Gibraltar, La Quina, La Ferrassie, Spy, Taubach, Ehringsdorf, etc.; seventy-four individuals of the Cro-Magnon and other races of late Stone Age times. The remains of 236 individuals of the broad- and narrow-headed races of peoples living after the Old Stone Age but preceding the New Stone Age were also found, making a total of 352 individuals, all of whom might be called fossil men, discovered in western Europe prior to the full advent of the New Stone Age or Neolithic time.

On the other hand, during the same period of more than a century (1823–1925), only a single discovery of prehuman or human remains had been made in the whole continent of Asia, namely, the *Pithecanthropus* or Trinil ape-man of Java; and as discovery sites of fossil man gradually studded the entire map of western Europe, was not the suspicion a natural one that man originated not in Asia but in Europe? As the American anthropologist Hrdlička observed in 1913:

> Europe, particularly in its more western and southern portions, has thus far proved the richest in ancient human remains. Africa, Asia, and those parts of Oceanica which were formerly connected with the Asiatic continent have as yet been but little explored. The island of Java, however, which is within the last-named region, has furnished an intensely interesting specimen bearing on man's evolution and antiquity. As to America, the researches have thus far yielded nothing that could possibly be accepted as representing man of geological antiquity. For the present, therefore, an account of the very ancient remains of man, with the exception of the Java specimen, must be limited to early European forms.

Twenty years earlier, in 1893, the distinguished French archaeologist, Salomon Reinach, of the Musée Saint Germain, deeply impressed with the vigorous development of early civilizations in western Europe during Neolithic times and throughout the early ages of metal, abandoned the generally accepted theory of an Asiatic origin of these industries as a *mirage oriental* and set forth with scholarly acumen the claims of western and northern Europe as an independent center of cultural dispersal during the Neolithic Age and the succeeding ages of Copper and of Bronze.

Consequently, with the prestige of Reinach and Hrdlička the west European theory of human origin gained a considerable number of adherents. When we reflect, however, and realize that whereas western Europe has been intensively explored foot by foot since the year 1823 and

that the anthropological exploration of Asia has barely begun, the contrast between the abundance of fossil remains from western Europe and the paucity of fossil remains from Asia becomes less remarkable.

The North Asiatic Theory

With the beginning of the science of anthropology in France there arose—from the purely scientific viewpoint—the question of the region in which mankind originated. This question was brilliantly discussed by Quatrefages in the fifth chapter of his great treatise, "Histoire générale des races humaines" (1889), wherein he treats the specific problem of the *origine géographique de l'espèce humaine*. After combating the idea of 'autocthonism'—the springing up of various ancestors of the human race in scattered areas of the earth's surface—and after dismissing the related speculations on 'polygenism,' or the independent origin of human species and races, he finally comes to the serious consideration of what he terms 'centres d'apparition' and turns his glance toward the great northern plains of Asia. He refers with approval to Nordenskiöld's theory which places the Eskimos among the most ancient northerly races of mankind, and then describes as follows a theoretic southward migration of primitive tribes which was enforced by the rigors of the great northern glaciation:

> Marchant surtout vers le soleil, elles rencontrèrent le massif central et ses dépendances. Elles s'arrêtèrent longtemps dans ces contrées; elles y virent l'aurore des temps qui ont succédé à l'époque glaciare; elles s'y mêlèrent ou se juxtaposèrent à celles de leurs sœurs qui les avaient précédées. Au cœur et tout autour de ce grand massif, les conditions d'existence étaient loin d'être les mêmes. Le milieu fit son œuvre; et cette region devint ainsi, non pas le *centre d'apparition de l'espèce*, mais le *centre de formation*, ou de *caractérisation des types ethniques fondamentaux* de l'époque actuelle.

At the opening of Chapter VI Quatrefages describes the peopling of the globe through migration from a north Asiatic center as follows:

> L'espèce humaine, primitivement cantonnée dans un centre d'apparition unique et peu étendu, situé vers le nord de l'Asie, est aujourd'hui partout. Elle s'est donc répandue de proche en proche, en marchant en tout sens. Le *peuplement du globe par migrations* est la conséquence forcée des faits précédemment exposés. Les polygénistes, les partisans de l'autochtonisme ne pouvaient accepter cette conclusion. Aussi ont-ils nié ces migrations.

The Central Asiatic Theory

The theory of human origin in central Asia was advanced as long ago as 1857 by Joseph Leidy in his studies on the aboriginal races of man:[1]

> It is not at all improbable that man (strictly the genus *Homo*) may have first originated in central Asia. When we reflect upon the gradual advance in intelligence in the scale of living beings, through successive geological periods, may we not infer that the apparently earlier civilization of the human race in Asia is indicative of its earliest advent in that portion of the world? Various races of man, in different geographical positions, may have acquired their peculiar characteristics (their specific origin) at successive periods long distant from each other. Perhaps when the aboriginal progenitors of the civilized Mexicans and Peruvians roamed as savage hordes through intertropical America, the great Arctic Ocean yet concealed the present northern United States in its depths, and Asiatic civilization was then just dawning from ages of night.

The theory of a *north Asiatic center*—defended as it was by the allusions of Quatrefages to a supposed northern influence on Palaeolithic art—and of a dispersal along lines of migration southward, eastward and westward, is quite distinct from the theory of *central Asiatic origin* advocated by Dr. William D. Matthew in his very able address on "Climate and Evolution" before the New York

[1] Joseph Leidy: Prefatory Remarks in Nott and Gliddon's "Indigenous Races of the Earth," J. B. Lippincott & Co., Philadelphia, 1857, p. xviii.

Academy of Sciences, February 13, 1911, in which he sums up the evidence for the origin and dispersal of mankind, as follows:

> We may with advantage begin our review of the special evidence in support of our theory with the migration history of man. This is the most recent great migration; it has profoundly affected zoögeographic conditions; it is the one where our data are most complete and accurate; we can perceive its causes and conditions most clearly, and we have a great deal of corroborative evidence in history and tradition.
>
> All authorities are today agreed in placing the center of dispersal of the human race in Asia. Its more exact location may be differently interpreted, but the consensus of modern opinion would place it probably in or about the great plateau of central Asia. In this region, now barren and sparsely inhabited, are the remains of civilizations perhaps more ancient than any of which we have record. Immediately around its borders lie the regions of the earliest recorded civilizations—of Chaldea, Asia Minor, and Egypt to the westward, of India to the south, of China to the east. From this region came the successive invasions which overflowed Europe in prehistoric, classical, and mediaeval times, each tribe pressing on the borders of those beyond it and in its turn being pressed on from behind. The whole history of India is similar—of successive invasions pouring down from the north. In the Chinese Empire, the invasions come from the west. In North America, the course of migration was from Alaska, spreading fan-wise to the south and southeast and continuing down along the flanks of the Cordilleras to the farthest extremity of South America. Owing to the facilities for southward migration afforded by the great Cordilleran ranges, the most remote parts of the New World are the forests of Brazil and of northeast South America. In the northern continent, Florida is the most distant from the source of migration.

The central Asiatic theory of human dispersal advocated by Matthew is clearly illustrated in the accompanying figure (Fig. 78), which agrees with the general thesis maintained in "Climate and Evolution" that primitive races of man, as well as primitive races of mammals, are constantly being thrust out from the center of dispersal into the most remote terminal regions of the earth's surface, whereby, viewing the earth from the North Pole, we see a fringe of primitive peoples—Australians, Bushmen, Negritos, Tierra

del Fuegians—thrust into peripheral regions as companions of primitive mammals like the monotremes, marsupials, and insectivores.

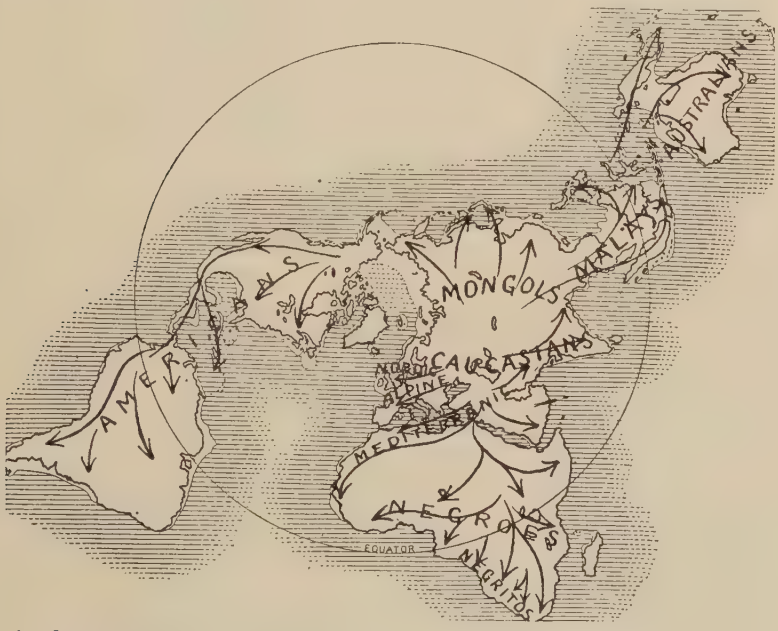


Fig. 78. Theoretic Dispersal and Distribution of the principal races of man from his central Asiatic homeland. After Matthew, 1915.

Although not unmindful of the weight of fossil and cultural evidence favoring the claims of Europe, the present author never swerved from his Asiatic belief and stoutly maintained that we must nevertheless adhere to the older Asiatic theory as by far the more probable. Thus the problem of the center of human origin, whether Asiatic or European, became one to be settled only by exploration in Asia, no less extensive and no less intensive than that which led to the wonderful discoveries in western Europe between 1823 and 1925.

Why Mongolia May Be the Home of Primitive Man

Stirred by the prediction of the present author in the year 1890 that central Asia would prove to be the homeland of all the greater forms of mammalian life, which from this original source migrated to other parts of the world, Roy Chapman Andrews aroused nation-wide interest in his great project to explore Mongolia for fossil man. Starting on its first expedition in the season of 1921, the Andrews party was not destined immediately to attain its goal of fossil or cultural human remains. During the two entire seasons of 1922 and 1923 the party journeyed for six thousand miles, skirting the western region of the Gobi without finding a single trace of fossil man, although encouraged by the discovery of a new continental life, of a new theater of mammalian evolution, which stimulated renewed and more intensive search for evidences of human occupation in the geologic past.

At the dramatic moment of the close of the season of 1923 when the discovery of the dinosaur eggs gave the expedition a world-wide fame, the present author joined Andrews' party in the east central region of the Gobi Desert and began to visualize the life environment of Tertiary time as ideal for the early development of the Dawn Men or the direct ancestors of the human race.

This line of thought led to the author's extemporaneous address on October 8, 1923, before the association of the Wen Yu Hui or 'Friends of Literature' on returning from the Mongolian plateau to Peking. This address, entitled "Why Mongolia May Be the Home of Primitive Man," expressed as logical the hope that fossil remains of the very earliest human beings may be found on the great central

Asiatic plateau and perhaps in Mongolia itself. It continued with the following argument:

> Before and after cave times men lived mainly in the open, along the river-bottoms, or river-drifts, or on the uplands or plateaus. Such a mode of life is conducive to the development of the finest physical and moral qualities of the race, for in the open, in intertribal competition, in resistance to and conquest of a natural environment, and in the opportunity for free migration lies the stimulus that carries man up the ladder of advancement. Life in the open preceded by hundreds of thousands of years the period of life in the caves, and when a race which has developed under the stimulating influence of an open, broad and varied environment is temporarily forced by the exigencies of the climate to seek shelter in the caves, its latent energy turns to new endeavors, its evolution follows a new direction. Such men are benefited spiritually and intellectually by a life in caves, for such a life of relative isolation turns them to reflection and to contemplation. Thus the period of cold and rigorous climate in Asia and Europe was one of vast importance in the spiritual and mental development of the race, just as the period of life in the open was one conducive to its physical and moral development.
>
> . . . . . .
>
> Thus the three fossil races, the Trinil, the Piltdown, and the Heidelberg, must themselves be distant descendants of an earlier ancestral race. Where did this race live and have its origin? This brings us to the question involved in the title of this address as announced, "Why Mongolia May Be the Home of Primitive Man." We observe that early man was not a forest-living animal, for in forested lands the evolution of man is exceedingly slow, in fact there is retrogression, as plentifully evidenced in forest-living races of today. Those South American Indians who live in the forests are backward in development as compared with those living in the open. Of the latter, those living in uplands are more advanced than those living in the river-drifts.
>
> Mongolia was probably not a densely forested country—this is indicated by the animal remains found there in the earlier deposits. An alert race cannot develop in a forest—a forested country can never be a center of radiation for man. Nor can the higher type of man develop in a lowland river-bottom country with plentiful food and luxuriant vegetation. It is upon the plateaus and relatively level uplands that life is most exacting and response to stimulus most beneficial. Mongolia always has been an upland country, through the Age of Mammals and before. It was probably a region forested only in part, mainly open, with exhilarating climate and with conditions sufficiently difficult to require healthy exertion in obtaining food supply. . . .

In the uplands of Mongolia conditions of life were apparently ideal for the development of early man, and since all the evidence points to Asia as the place of origin of man, and to Mongolia and Tibet, the top of the world, as the most favorable geographic center in Asia for such an event, we may have hopes of finding the remote ancestors of man in this section of the country. However, this Mongolian idea must be treated only as an opinion; it is not yet a theory, but the opinion is sufficiently sound to warrant further extended investigation.

The Undiscovered Dawn Man of Central Asia

This high plateau country of central Asia was partly open, partly forested, partly well-watered, partly arid and semi-desert. Game was plentiful and plant food scarce. The struggle for existence was severe and evoked all the inventive and resourceful faculties of man and encouraged him to the fashioning and use first of wooden and then of stone weapons for the chase. It compelled the Dawn Men—as we now prefer to call our ancestors of the Dawn Stone Age—to develop strength of limb to make long journeys on foot, strength of lungs for running, and quick vision and stealth for the chase. Their life in the open, exposed to the rigors of a severe climate, prompted the crude beginnings of architecture in their man-made shelters, and the early use of fire for bodily warmth and for the preparation of food.

The conception of the early development of man in a high plateau country accords with all the known principles of the rise of man and is well-established by observations in the Holocene or Recent period of the Age of Man. In support of this view we may note: First, that the rise of man is arrested or retrogressive in every region where the natural food supply is abundant and accessible without effort—in tropical and semi-tropical regions where natural food fruits abound, individual and racial human effort im-

mediately slows down; second, that all precocious intelligence and early civilization in mankind were fostered in open regions where the food supply is scarce and impossible to obtain without individual effort and resourcefulness.

The corollary of these two principles is the third: That during Tertiary times all the lowlands of Asia were relatively well forested and well watered, with a relatively accessible food supply—conditions altogether favorable to the continued development of the great anthropoid apes, as well as to the retention of arboreal or semi-arboreal habits of life, but *altogether unfavorable to the rise of man.* In brief, *while the anthropoid apes were luxuriating in the forested lowlands of Asia and Europe, the Dawn Men were rising in the invigorating atmosphere of the relatively dry plateaus of central Asia.*

The first evidence in support of the author's belief that man inhabited the high plateaus of Asia at a very early stage of his development was afforded by the great discovery of Père Teilhard de Chardin and Père Licent, who found deposits of Mousterian artifacts associated with the fossilized bones of animals at three different sites in the province of Ordos, northern China, in 1923; this discovery will probably lead to the discovery of a Neanderthaloid race in this region, for such a race has now been found in Palestine. A full account of the Ordos discovery has been given by Père Teilhard de Chardin himself.[1]

Andrews Strengthens the Central Asiatic Theory

Reinforced by a highly trained and experienced archaeologist, Dr. Nels C. Nelson of the American Museum staff, the expedition of 1925 started out more determined than

[1] Teilhard de Chardin: Fossil Man in China and Mongolia. *Natural History*, Vol. 26, No. 3, 1926.

ever to secure either negative or positive evidence bearing on the central Asiatic theory of the origin of human dispersal. The brilliant positive results are known to the world through cablegrams and later reports from the leader of the expedition, and through Dr. Nelson's description of the discovery in an article entitled "The Dune Dwellers of the Gobi."[1] Subsequent discoveries included flint implements of Mousterian type, closely similar to those found before the cavern of Le Moustier in France, of the Old Stone Age period, thus affording evidence of man's existence in the much earlier Mousterian industrial period which, in Europe, coincides with the dominance of the Neanderthal race. Indications of still earlier stone industries are also found in Mongolia which may belong to Acheulean times; and also possible indications of the Dawn Stone or Eolithic Age. The latest evidence in favor of Asia as the home of primitive man was supplied by Turville-Petre's surprising discovery (August, 1925) of a skull of Neanderthal type in Palestine—known as the 'Galilee' skull.

This rapid sequence of discoveries within the brief period of three years (1923–25) strengthens the author's conviction that central Asia is the homeland of the human race.

The Racial Problem before the Time of Darwin

Granted for a moment that the relatively dry plateau region of central Asia is the most probable homeland of man, there remains the problem of the manner in which human races of different kinds arise. These lectures concern chiefly the higher faculties of man, but let us first pass in review the century of discussion regarding the physical

[1] Nels C. Nelson: The Dune Dwellers of the Gobi. *Natural History*, Vol. 26, No. 3, 1926.

structure of man, the nature of human species and the origin of subspecies and races of different kinds. Such origin is going on before us today and affords the best insight into what took place in the past, even back at the beginning of the Stone Age. The study of racial origins becomes a matter not only of concern to the intellectual life of the world but will be a matter of vital importance in all departments of human endeavor. It will even become a matter of political importance, a matter to be taken into consideration by the State. Indeed it is already being considered in this way in the United States as we begin to realize that different races respond very differently to our political institutions.

The question of the dispersal and divergence of human races takes us back to the period prior to the publication of Darwin's "Descent of Man," when fossil man was unknown and when there was warm debate as to whether all the numerous varieties of mankind belong to a single species. Undoubtedly, if an unbiased zoölogist were to descend upon the earth from Mars and study the races of man with the same impartiality as the races of fishes, birds, and mammals, he would divide the existing races of man into several genera and into a very large number of species and subspecies.

In 1875, Armand de Quatrefages, professor in the Museum of Natural History, Paris, delivered a course of elementary lectures on "The Natural History of Man"[1] to audiences of working people in Vincennes. These delightful lectures represent the pre-Darwinian point of view and dwell with emphasis upon the *unity of human species* and

[1] Jean Louis Armand de Quatrefages de Breau: The Natural History of Man, A Course of Elementary Lectures.

upon the *intellectual, moral, and spiritual distinctness of man* as compared with any other order of animals. We recall the fact that in 1875 Quatrefages was profoundly influenced not only by the then prevailing ideas of the special creation of man as a distinct species but also by the classification of the great Swede, Linnaeus (Carl von Linné), father of systematic botany and zoölogy.

In support of his opinion that all the greater and lesser divisions of the human race belong to a single species, namely, *Homo sapiens*, Quatrefages devotes Chapter I to the discussion of fertility. He observes: "*Fertility is the law of union between animals belonging to different races* (mixed breeding)," whereas "*infertility is the law when animals of different species unite* (hybridization)." His argument as to fertility is now known to be invalid; we know that, both in nature and in experiment, many distinct species and even distinct genera of plants and animals occupying overlapping geographic areas may interbreed freely and may leave a long series of hybrid descendants, some of which are highly useful both in plant culture and in animal culture. One species and subspecies may interbreed with another and produce a great variety of half and quarter breeds. Thus *inter-fertility is not a bar to specific distinction or even to generic distinction in the lower mammals or in man.* In the family of Bovidae, for a parallel, several genera and species freely interbreed, e.g., our domestic cattle (*Bos taurus*) and the bison (*Bison americanus*).

The Primary Human Stocks, or Super-Races

During the eighteenth century, in the course of developing his monumental "Systema Naturae," Linnaeus rendered an immortal service to science when he introduced

the term *Homo sapiens* to express the fact that man stands apart from other Primates as the substantive genus *Homo*, and that the first species of man we know is entitled to the adjective *sapiens*. By profound change both in our knowledge of facts and in our theories and conceptions since the time of Linnaeus and even of Quatrefages, through anatomical researches among the Asiatics and Africans, we now subdivide *Homo sapiens* into three or more absolutely distinct stocks, which in zoölogy would be given the rank of species, if not of genera; these stocks are popularly known as the Caucasian, the Mongolian, and the Negroid:

Homo sapiens europaeus—North and south Eurasiatic stock, wavy hair (cymotrichous) with intermediate cross section. Broad- or long-headed. Tall to medium stature. (= CAUCASIAN, including the Nordic, Alpine, Mediterranean and other races.)

Homo sapiens asiaticus—Extreme East Asiatic stock. Straight hair (lissotrichous) with round cross section. Broad-headed. Medium to tall stature (American Indian). (= MONGOLIAN, including the Chinese, Mongol and other races.)

Homo sapiens afer—African stock. Closely curled hair (ulotrichous), flattened cross section. Narrow-headed. Short to tall stature. (= NEGROID, including the Negro and Negrito races.)

The spiritual, intellectual, moral, and physical characters which separate these three great human stocks are very profound and ancient. In the author's opinion these three primary stocks diverged from each other during the Age of Mammals, even before the beginning of the Pleistocene or Ice Age. The Negroid stock is even more ancient than the Caucasian and Mongolian, as may be proved by

an examination not only of the brain, of the hair, of the bodily characters, such as the teeth, the genitalia, the sense organs, but also of the instincts and the intelligence. The Mongolian is somewhat less profoundly different from the Caucasian than is the Negro. The intelligence and morale of the Mongolian may fully reach the high Caucasian level, as shown in great periods of Chinese history, but except in the plateau region of Asia his physical development seldom equals that of either the Negroid or the Caucasian, which give rise to the tallest races in the world.

The hair happens to be one of the most conspicuously distinctive and constant features of these three species of

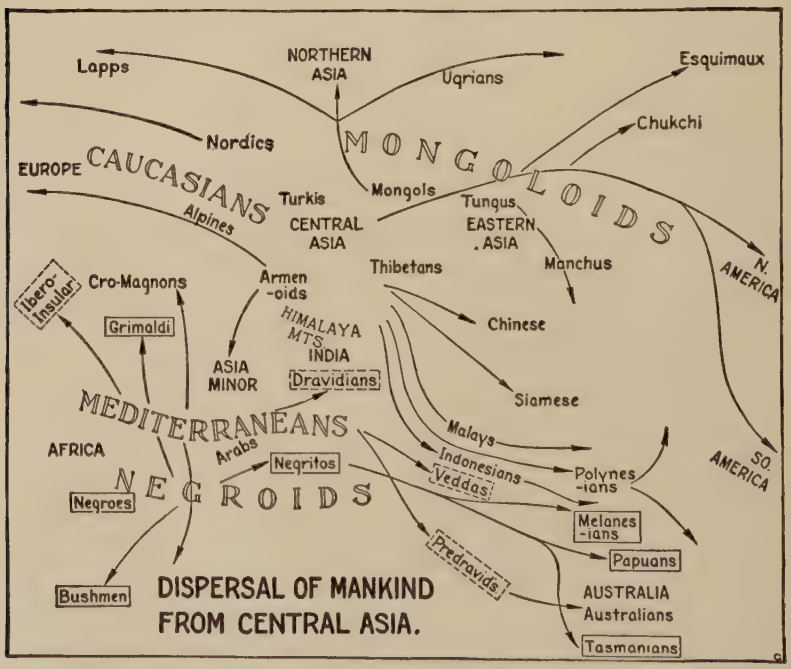


Fig. 79. Theory of Central Asiatic Origin and Dispersal of Mankind. After W. K. Gregory, 1924. Leidy, Matthew, Osborn and Gregory are among those who have favored the theory of an upland or plateau region as the original homeland of man.

man. Skin color is less uniformly distinctive. The Mongolians are yellow to dark brown or bronzed in skin color. The Negroids are generally dark brown to full black. The Caucasians are extremely fair-skinned in the North, light-brown-skinned in the South, very dark-brown-skinned in subtropical Polynesian hybrid branches like the Hawaiians.

The Three Primary Races of Europe—the Nordic, the Alpine and the Mediterranean

Linnaeus also defined the variety *Homo sapiens europaeus* as white, sanguine, and muscular, with fair, wavy hair and blue eyes. We may take this as a starting point for our review of the relation of terminology to our present knowledge of the races of man.

The European variety of man which Linnaeus had in mind in naming *Homo sapiens* is not all Scandinavian, but includes three very distinct subtypes, races, or stocks, namely, the Scandinavian or Nordic, the Alpine or Ostro-Slavic, and the Mediterranean, each distinguished by racial characters so profound and ancient that if we encountered them among birds or mammals we should certainly call them *species* rather than *races*. Since, however, they coincide with racial distinctions, we adopt for these secondary races of man the three subspecific terms:

Homo sapiens europaeus nordicus—the tall, fair-haired, blue-eyed, narrow-headed, narrow-faced Nordic race (see page 138).

Homo sapiens europaeus alpinus—the medium-statured, dark-haired, gray- or brown-eyed, broad-headed, broad-faced Alpine race (see page 138).

Homo sapiens europaeus mediterraneus—the medium-

statured, black-haired, dark-eyed, narrow-headed, narrow-faced Mediterranean race (see page 139).

In the preceding lectures we have observed that each of these races arrived in Europe during the latter part of the Old Stone Age with distinctive cultural and spiritual characteristics, as witnessed in their art and in their industry. We know that each of these European races is distinguished by innumerable differences of character and predisposition, spiritual, intellectual, moral, and physical. For example, the Nordic and Alpine races have a hairy covering over the greater part of the body. The men are heavily bearded, in adaptation to the severe climate of the cold northern regions from which the Nordics sprang, or to the cold mountain and plateau region from which the Alpine-Slavs sprang. The members of the Mediterranean race, on the other hand, have relatively smooth and hairless bodies, in adaptation to the warm southern coast regions of Eurasia from which they sprang.

Causes of the Divergence of Races, Species and Stocks

The color divergence in the three primary human stocks is only one of the most conspicuous of thousands of divergent characters which have been brought about through the long influences of mate selection, of indirect adaptation to climate, of the direct influence of climate, of the influence of habit, and of 'organic' or coincident selection.[1] At present *the prolonged or secular influence of habit, of organic selection and of mate selection* seems to be among the prime causes of the divergence of human races. The

[1]The theory of organic or coincident selection independently proposed by the psychologist James Mark Baldwin, the biologist C. Lloyd Morgan and the present author is practically subsidiary to Darwin's theory of natural selection and Lamarck's theory of modification. Examples of this principle are given herewith in explaining the possible origin of 'arboreal,' 'aquatic,' or 'cursorial' races or types of men.

opening petition of the Lord's Prayer, "Give us this day our daily bread," is a recognition of the world-wide fact that the primitive man must first think of the food supply for himself and his family. Exactly like an animal, he is compelled to work for his food supply, to seek it where the environment offers it, whether in the chase of animals or birds, in fishing, or in agriculture. The search for food has led man into various habits and habitats to which he was more or less fitted by intellectual, moral, and physical predispositions.

These predispositions are hereditary and therefore subject to 'organic selection.' By heredity men may be predisposed to arboreal, to cursorial, to terrestrial, or to amphibious life. The born climbers take to the trees, the born swimmers take to the water, the born runners take to the chase. But in turn these very habits of arboreal life, of aquatic life, of cursorial or running life, through the process of individual modification and self-adaptation, are self-perfecting. Those who attain the greatest skill and facility are naturally the most successful members of the tribe; they are the best climbers, the best fishermen, the best hunters, and they are rewarded by the first choice of wives and blessed with the first crop of offspring.

Have we wandered far from our subject, the evolution and terminology of human races? Not at all. We have, on the contrary, come to the very heart and philosophy of it, because the genesis of human races was exactly like the genesis of animal races prior to the era of civilization. Following alike the principle of adaptive radiation, man goes forth to seek and labor for food. He may go to the temperate regions, to the North Pole, or to the Equator. If he chooses the Equator the quest for food is very easy and

requires relatively little intelligence; the environment is not conducive to rapid or varied organic selection; the struggle for mere existence is not very keen; the social and tribal evolution is very slow; intellectual and spiritual development is at a standstill. Here we have the environmental conditions which have kept many branches of the Negroid race in a state of arrested brain development.

During the Old Stone Age the food supply was primarily from the chase or from the quest of natural fruits; during the New Stone Age the food supply came primarily from agriculture. The Mongoloid races at a very early stage exhausted their animal food supply and were compelled to turn to agriculture. This explains the extraordinary industry, vitality, and working powers of this people, which are the result of ages of organic selection. A Chinese or Mongoloid workman has far greater endurance and is capable of more continued effort on less food and a lower energy (calorie) diet than the Caucasian, who, until the game supply began to be exhausted in the forests and plains of northern Eurasia, was chiefly a hunter and fisherman.

The prime cause of the rise of the specific and subspecific characters of man prior to the New Stone Age was, therefore, the varied quest for food. This quest led man into certain new environments, the new environments compelled him to adopt new habits and modes of motion, and the new habits and modes of locomotion produced new modifications and changes of form which are accumulated through organic selection and inborn predisposition or preference. This is not the Lamarckian theory of the direct inheritance of acquired adaptations; it is *a theory of prolonged or secular inheritance of predispositions which happen to coincide with the new demands and habits of life.* This

process of organic or coincident selection operates over very long periods of time.

The new environments in turn throw all the old adaptations out of balance and put new survival values on certain characters. The heavy beard is a distinct advantage to the Nordic and to the Alpine hunter. The hairy covering of the body is of benefit to the Alpine Slav of the cold plateau regions. On the contrary, the Mediterranean subspecies and the Negroid species develop hairless bodies, partly because hair is unnecessary with a very dark skin, partly because hair and clothing harbor insect carriers of infectious diseases, from which it is easy to protect the nude and hairless body. The Mongoloid races, although partly migrating into the coldest regions of the earth, have never acquired a hairy covering and are as hairless as the Negroids; the same is true of the American Indian.

Individual choice of habit and of habitat, with men as with animals, has by these means been the polestar of the rise of man.

Lamarck was right in a secular or geologic sense when he said that organs were acquired when animals *strove for them*; they are first acquired as non-heritable *modifications*; in the course of ages they are acquired as true hereditary adaptations. This choice of habit or of habitat has sometimes been optional, a matter of pleasure in choosing between two or more alternatives, and sometimes enforced. Alden Sampson has shown that the white-tailed deer (*Odocoileus macrourus*) of the western United States seeks no less than seventy-three kinds of food during the course of the year. Among the antelopes of Africa there is a great seasonal range of diet for certain species; others, like the

Oribi, are said to browse only on a single kind of plant to which the animal is exclusively adapted.

Man, like the bear, is naturally omnivorous, but he may be forced to an exclusively frugivorous diet, as among the plantain eaters; to a strictly graminivorous diet, as among the rice eaters; or to an exclusively flesh and fat diet, as in the case of the most northerly Eskimo. An exclusive diet tends to the organic selection of a modified type of dentition, of a modified musculature of the jaws, and of modification of the digestive tract, all of which organs are extremely modified in the Eskimo.

The choice, however, leads to a readjustment of all the internal and external reactions of man as a mechanism, to a change in all survival values, and to a new series of actions, reactions, and interactions between the developing and race-begetting man and his lifeless and living environment. This is the author's conception that the rise of man is due to four sets of causes acting coincidently; namely, heredity or predisposition, habit or individual adaptation, the rigors or clemency of the environment, and the animal or human life by which man is surrounded. This is technically expressed in two words of Greek origin, 'tetraplastic' and 'tetrakinetic,' signifying the interaction of four sets of forces.

The Influence of Posture on the Human Skeleton

In a most valuable essay by Arthur Thomson in 1889, "The Influence of Posture on the Form of the Articular Surfaces of the Tibia and Astragalus in the Different Races of Man and the Higher Apes," we find clearly brought out the distinction between *congenital* variations and those which may be *acquired* by prolonged habits of life. It is

perfectly clear from this investigation that certain racial characters, such as 'platycnemism' or flattened tibia, which have been considered of great importance in anthropology, may prove to be merely individual modifications due to certain local and temporary customs. Thomson's conclusions are that the tibia or shin is the most variable in length and form of any long bone in the body. Platycnemia, i.e., flattened tibia, is most frequent in tribes living by hunting and climbing in hilly countries, and is associated with the strong development of the *tibialis posticus* muscle. The great convexity of the external condyloid surface of the tibia in savage races appears to be developed during life by the frequent or habitual knee flexure in squatting; it is less developed where the tibia has a backward curve and is independent of platycnemia. Another product of the squatting habit is a facet formed upon the neck of the astragalus (heel-joint bone) by the tibia. This facet is very rare in European man; it is found in the gorilla and orang, and occasionally in the chimpanzee. We must therefore be on our guard to distinguish between congenital or hereditary skeletal adaptations which are fundamental, and 'acquired' skeletal adaptations which may not be hereditary.[1]

The Amphibious Life of the Primitive Hawaiians

The early explorers were all impressed with the amphibious life of the natives of the Sandwich Islands and with their fearlessness and dexterity. On Vancouver's second journey, in the years 1793–94, he was accompanied by the botanist Archibald Menzie, in whose journal,[2] February 5, 1794, we find the following observations:

[1] Compare pages 216-217
[2] See Hitchcock: Hawaii and Its Volcanoes, p. 65.

After the whole party had breakfasted we left Honomazino in our canoes about nine in the morning and soon after passed the western part of the Island which is a dreary tract of the most rugged rocks of lava scattered here and there with some fishermen's huts. About noon we came to a small village named Manaka where we found our Chief Rookea's residence and where we landed before his house at a small gape between rugged precipices against which the surges dashed and broke with such violence and agitation and with such horrific appearance, that even the idea of attempting it chilled us with the utmost dread. We, however, quietly submitted ourselves to their guidance and were highly pleased to see the extraordinary dexterity with which they managed this landing. Having placed their canoe in readiness before the gape they watched attentively for a particular surge which they knew would spend itself or be overcome in the recoil of the preceding surges before it could reach the rocks, and with this surge they dashed in, landed us upon a rock from which we scrambled up the precipice and in an instant about 50 or 60 of the natives at the word of command shouldered the canoe with everything in her, and clambering up the rugged steep, lodged her safely in a large Canoe-House upon the brink of the precipice, to our utmost astonishment.

. . . . . .

In the afternoon our attention was at one time directed to a number of young women who stripped themselves quite naked upon the summit of a pending cliff, and taking a short run vaulted one after another from the brink of it headlong into the sea, regardless of the foamed and agitated appearance of that element, and as it were setting its wildest commotions at defiance, for at this time the surf ran very high and dashed with furious force against the cliff, yet they dexterously disentangled themselves, and clambering up the rock again, repeated their leaps several times with seeming satisfaction till they were quite fatigued. The cliff was at least thirty feet high and so very rugged with packed rocks which were now and then deluged with a boisterous surf, that to look down the precipice was enough to intimidate any one not accustomed to such extraordinary feats of activity.

More recently so trustworthy an observer as Frank Bullen[1] describes a feat of which he was eye-witness. Half a mile from the towering mass of Sunday Island, exposed to the full force of the gigantic swell of the South Pacific, a young Kanaka sailor left the boat, landed in a weltering whirl of rock-torn sea, climbed the steep sides of the cliff

[1] Frank T. Bullen: The Cruise of the *Cachalot*, pp. 299, 305–307.

Fig. 80. THE MOST FAMOUS RUNNING TYPE—Paavo Nurmi of Finland. Observe the feeble arms, broad chest and waist, and strong limbs. Photograph by Underwood and Underwood.

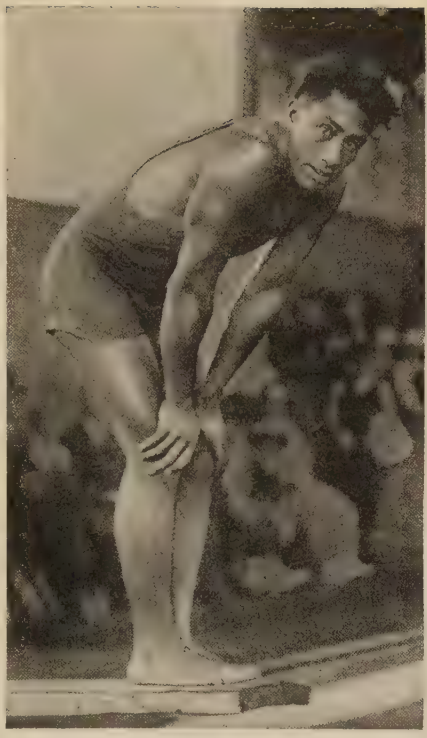


Fig. 81. THE WORLD-FAMOUS SWIMMING TYPE—Duke Kahonomoku of Hawaii. Observe the extremely broad shoulders, strong arms, narrow and slender waist, strong limbs and large feet. Compare the slender waist with the slender-waisted 'cup-bearers' of the Minoans of Crete. Photograph by Underwood and Underwood.

Fig. 82. THE SUPERIOR CLIMBING TYPE. Pygmies of the Belgian Congo grasping the tree by the inturned soles of the feet and the arms, without the aid of a girdle. After Herbert Lang. Certain monkeys and anthropoid apes ascend the trunks of trees in a similar manner, but their arboreal life is chiefly in the branches of trees, the swinging or brachyating habit being most highly developed in the gibbon of Borneo. (This picture is a combination of two photographs.)

Fig. 83. EFFECTS OF THE SQUATTING HABIT, as seen in a native blacksmith of the Belgian Congo. Observe the feeble limbs and narrow chest. After Herbert Lang. The squatting-anatomy of this Congolese should also be found in the expert flint workers of the Old Stone Age. (See pages 208, 209, 216, 217.)

and seized a wild goat, the object of his quest. In the struggle both lost their footing and tumbled down the cliff in a small avalanche of stones and dust. Although badly battered—not by his swim but by the fall—the man lashed the goat to his naked body, ignoring its struggles, crawled out on the rocks and dove once more into the turmoil of breakers, returning to the boat in triumph with the goat, none the worse for the experience.

How to Produce an Arboreal Type of Man

As the swimming habit will produce through individual preference an amphibious type, which might be perfected in successive generations through organic selection of the most apt swimmers, so an *arboreal* type might be produced. Thus the author observed in 1896,[1] in first defining the principle of organic and coincident selection:

> If the human infant were brought up in the branches of a tree as an arboreal type instead of as a terrestrial, bipedal type, there is little doubt that some of the well-known early adaptations to arboreal habit (such as the turning in of the soles of the feet and the grasping of the hands) might be retained and cultivated; thus a profoundly different type of man would be produced. . . . During the enormously long period of time in which habits induce ontogenic variations, it is possible for natural selection to work very slowly and gradually upon predispositions to useful correlated variations, and thus what are primarily *ontogenic adaptations* become slowly apparent as *phylogenic adaptations* or congenital characters of the race. Man, i.e., *Homo sapiens*, for instance, has been upon the earth perhaps seventy thousand years; natural selection has been slowly operating upon certain of these predispositions, but has not yet eliminated those traces of the human arboreal habits, nor completely adapted the human frame to the upright position. This is as much an expression of habit and ontogenic variation as it is a constitutional character.

[1] Osborn: A Mode of Evolution Requiring neither Natural Selection nor the Inheritance of Acquired Characters. *Trans. N. Y. Acad. Sci.*, Vol. XV, March 9 and April 13, 1896, pp. 141–142, 148. (The word 'adaptation' is substituted for 'variation.')

At the time the above passage was written, the author adopted the widespread current faith in the direct arboreal ancestry of man. Robinson's well-known photograph of the baby clinging to a broom handle, with its feet turned in, had just been published, and no fossil human skeletons were known at the time to rebut the prevailing arboreal hypothesis. The author has now entirely abandoned the arboreal hypothesis and believes that man has descended from cursorial or running ancestors. Since then the complete skeleton of the Neanderthal man has been discovered, and the balanced proportions of the upper and lower limbs lend no support to the arboreal hypothesis. The Neanderthal man is descended from many hundreds of thousands of generations of *walkers*, not of tree climbers.

Another line of evidence *against* the arboreal theory has recently come to mind. It is that when man does take to the trees it is never in the manner of the chimpanzee or of the gorilla, but in the manner of the bear, i.e., of "shinning the tree," by embracing the trunk with the arms and shins (Fig. 82). No anthropoid ape displays this power, which is among the early instincts of every boy. The ape must rise into the tree not by the trunk route but by the branches. Once started, the swinging action resembles that of a man on a trapeze. The grasping is done with all five fingers, including the rudimentary thumb *placed over the branch*. The thumb is not used either by the ape or by the trapeze expert, because the hand must instantly hook itself over the branch. Consequently the thumb is not developed; all arboreal mammals are practically thumbless.

As a boy of ten the author watched the Spanish lads near Murcia, Spain, climbing the date palms. They placed

a fibre girdle around the slender trunk and, swaying backward and forward, arose by slipping the girdle higher and higher, turning the soles of the feet inward on the outer sides of the trunk. This method of tree climbing, with all its variations, is purely a human achievement. As tree climbing is observed among the Hawaiian boys, no girdle is used; the slender trunk of the cocoanut palm is seized by the hands and, where possible, the body leans backward and the feet are placed sole downward against the trunk.

In the author's opinion, which differs radically from that of many of his colleagues, *the quadrumanous arboreal phase in man was extremely remote in geologic time and was never a very profound or exclusive mode of life.* The anatomical evidence does not point to a prolonged period of arboreal existence, but rather to a prolonged period of terrestrio-arboreal habit, during which our very remote ancestors lived and fed chiefly upon the ground but sought protection in the trees from their enemies. In brief, we do not believe the case has been proved for arboreal man, chiefly because neither the human leg and foot nor the human arm and hand retains proofs of prolonged arboreal adaptation; on the contrary, the human hand is of a non-arboreal type, as far as possible from the thumbless, trapeze-motion hand of the gibbon. Secondly, the human foot retains no traces of the grasping foot and big toe of the higher apes. In short, the better we understand the human anatomy and mechanism of both the hand and foot and the more we learn of the fossil ancestors of man, the less close appears our relationship to the great anthropoid apes, the gorilla, the chimpanzee, the orang, and the gibbon.

How a Secondary Race of Squatting Men Might Be Produced[1]

The anatomy and physiology of a tailor as studied by the British anatomist, Sir Arbuthnot Lane, in the year 1888, show that the lifelong habits of a tailor engaged in his confining and laborious trade actually produce a distinct type of man. The type is now extinct, for the modern tailor works only at machines. Such a type, if it became heritable and thus established, might be described humorously as a new variety, *Homo sapiens sartorius*. In the old days the tailor sat with bent form, with crossed legs, jerking his head sharply to the side in drawing the needle and thread with his thumb and forefinger through the resistant cloth—sartorial habits which, if prolonged through a lifetime, would produce many new characters.

The following are only a few of the modifications of muscles, tendons, and bones produced in individuals by hundreds of repetitions of similar motion which might conceivably result in the evolution of the hypothetic new variety—*Homo sapiens sartorius*—in which these modifications would be heritable: The muscles tend to shorten and recede into tendons; the tendons grow relatively longer and the bony surfaces into which they are inserted tend to grow in the direction of the pull which the muscles exert upon them; the articulation between the breastbone (sternum) and the collar bone (clavicle), normally a close junction, is modified into a very complex movable joint almost of the character of a typical hinge joint, like that of the elbow. Owing to the prolonged squatting posture, which compresses the chest and prevents the free rise and fall of the ribs and chest breathing, the six pairs of ribs

[1] Compare Fig. 83, p. 212.

become firmly coössified with the respective vertebrae of the back, indicating that they have ceased to rise and fall with sternal breathing and that by way of compensation respiration is almost exclusively by means of the diaphragm, which, in the normal human being, supplements the rise and fall of the chest. To accommodate the side jerk of the head which the tailor pursuing his trade for a period of twenty or thirty years repeats thousands of times, the right side of the skull forms a new joint with the broad transverse flange on the right side of the first vertebra of the neck (the atlas). This joint is adaptive; it relieves friction between the side of the skull and the side of the vertebra. A small synovial cavity containing the fluid surrounds this newly acquired sartorial joint. This provision for freedom of movement on the right side of the neck is balanced by a rigid fixation on the left side of the neck because the left half of the second vertebra (the axis) is firmly united by bone to the left side of the third vertebra. Thus the second and third vertebrae tend to form a single bone. This fixation is also adaptive, fitting the tailor to his peculiar mode of living. But Nature does not stop here. Dr. Lane finds that the peglike process (the odontoid) of the axis is prolonged in its socket of the atlas and that a new transverse ligament is formed to keep this peg from slipping out of place and pressing on the spinal cord. (It is pressure of the axis upon the spinal nerve and rupture of the transverse ligament that produce instantaneous death in hanging.) In brief, the anatomy of the tailor is full of *new anatomical adaptations*, caused partly by fixation of motion, partly by exaggeration of motion.

These anatomical changes, effected during the lifetime of the individual, serve to emphasize the great contrast be-

tween the rapidity of individual adaptation or modification and the slowness of race adaptation or evolution. All these marvelous adaptive modifications die with the individual; none of them is inherited. The son of this tailor will not exhibit any of these newly acquired characters—his ribs and vertebrae will move freely upon each other. It is only through the slow process of the *coincident selection of predispositions toward the sartorial form of body that a new sartorial race could be produced* in which these sartorial modifications would become *inherited characters*. Again, this sartorial race, like the amphibious or the arboreal race spoken of above, would emerge only after the selection of hundreds or perhaps thousands of generations of those individuals in which the body is peculiarly adapted by predisposition to the sartorial habit. All the evidence we have, like that of the fossil horse, for example, shows that modifications produced by peculiar habits, if transmitted at all, would be imperceptible in one generation. The horse has not yet lost its lateral fingers and toes which began to be useless nearly twenty million years ago, at the beginning of the Oligocene period.

The Future Rise of Man

Our first conclusion from the world-wide studies and observations of the post-Darwinian period is quite contrary to that of Quatrefages quoted at the beginning of this lecture. We have discovered that races, 'species,' and stocks of man arise in the same manner that races, species, and genera arise among other mammals.

A burning question of the present day is whether man is destined to rise or to fall, and many and varied answers are being attempted. After a preliminary survey of the ques-

tion let us endeavor to answer it in the language of Aeschylus, as if he were come to life with his incomparable powers of observation and analysis.

The rise of primitive and of uncivilized man is subject to the same laws as those which prevail throughout the animal kingdom, until human civilization steps in and interferes with the natural orders of things. Thus when man begins to specialize and human races begin to intermingle, Nature loses control. It appears that the finest races of man, like the finest races of lower animals, arose when Nature had full control, and that civilized man is upsetting the divine order of human origin and progress.

Several recent writers on the subject of the future rise and development of man, among them Bury, Inge, and Conklin, take a decidedly pessimistic view. They are no doubt under the influence of the shock of the great World War, which they regard, and in a measure rightly so, as a calamity of the first magnitude in contrast to the optimism of the Victorian period.

It is quite true that European nations have suffered terribly and that the effects of the struggle have been chiefly deteriorative to the race. France, after the Napoleonic war had already cut off three inches from the stature of the average man, lost 1,400,000 of its best men. England too has deteriorated racially, and so has Germany. Of the original Nordic stock—the men of the time of Goethe and Schiller—only one-tenth remains; nine-tenths of the population of Germany are of Alpine-Slavic stock. In America the original pioneer stock is dying out; the foreign element is in the ascendency. China, in the opinion of Dr. Ting, is not much better off—the deterioration of

the Chinese race being due, however, not to war but to the absence of the great force for betterment which lies in sexual selection or the choice of wives.

Racial deterioration appears to prevail throughout the world today; our policy seems to be that of care for the individual, neglect for the race. This doctrine of individualism, so rampant everywhere, is the greatest deterrent to racial progress. We must return to the viewpoint so well expressed by Tennyson in apostrophyzing the record of Nature's mode of work seen in the wealth of fossil remains in the rocks:

> So careful of the type
> She seems, so careless of
> The single life.

The future rise of man is intimately related to that of the special race to which he belongs; this is true not only of his physical nature but of his mental and spiritual nature as well—they too depend on the mental and spiritual ascent of the race of which he is a unit. Every race has a different kind of soul—by soul is meant the spiritual, intellectual and moral reaction to environment and to daily experience —and the soul of the race is reflected in the soul of the individual that belongs to it. This racial soul is the product of thousands or hundreds of thousands of years of past experience and reaction—it is the essence or distillation of the spiritual and moral life of the race. In Europe, for example, the soul of each of the three great races—the Alpine, the Mediterranean and the Nordic—is individualized, it is the product and summation of its own racial experience in the long past of its development.

Care for the race, even if the individual must suffer—this must be the keynote of our future. This was the

guiding principle which underlay all the discussions of the Second International Congress of Eugenics[1] in 1921. Not quantity but quality must be the aim in the development of each nation, to make men fit to maintain their places in the struggle for existence. We must be concerned above all with racial values; every race must seek out and develop and improve its own racial characteristics. Racial consciousness is not pride of race, but proper respect for the best qualities and characteristics which each race possesses. Purity of race is today found in but one nation—the Scandinavian; but Scandinavia has been seriously bled by emigration—so many of its best men have left the homeland for America that today the dependent class is relatively large; realizing these conditions, the Scandinavian people have set on foot a movement to keep the best men and women at home, and such a movement has also been begun in the United States. Such new racial consciousness is a hopeful sign, and with it before our eyes we need not despair.

When our understanding of the spiritual, intellectual, and moral, as well as physical, values of races becomes more widespread, the course of the rise of man to Parnassus will again take an upward trend and the future progress of the human race will be secure.

[1] The author was elected president of this Congress, which has exerted a great eugenic influence in the United States.

EPILOGUE

EPILOGUE

PROMETHEUS, *gifted with divine inspiration, is moved to compassion by the sufferings of mortals and subjected to prolonged torture for his audacity in conferring on mortals the gifts of Nature and of Art.*

This demigod is the prototype of those daring human pioneers, innovators, and inventors who have risked all in quest of new truth. Of Promethean order are Socrates, Bruno, Galileo, defiant of pagan and other false gods, fearless of ostracism, of imprisonment; of the same order, in our day, Müller, Lazear, and Reed, zealous of healing truth, alike fearless of death.

Would that Aeschylus of prophetic vision could come to earth after his two thousand three hundred eighty-three years among the shades, to witness the marvellous discoveries in the prehistory and history of man inspired by the example of Prometheus and doubtless latent in the mind of Aeschylus himself in his apostrophe:

> O divine aether, and ye swift-winged breezes, and ye fountains of rivers, and countless dimpling of the waves of the deep, and thou earth, mother of all—and to the all-seeing orb of the Sun I appeal.

Let us in imagination escort him through the furnaces of steel, the prophecies of storm and wind, the myriad foes of disease, the wondrous variety of domesticated animals, the ships above and beneath the sea and among the clouds, the libraries stacked with memories of the past and the literature

of all time, the towering architecture, the millions of stars and distant universes of astronomy.

In the pages of this volume let us verify his retrospect of the life of the caves, of the ages of flint, of bronze, of iron.

Then, in our pride of Promethean conquest of Nature, let us humbly ask: Have we, in our literature, our art, our conduct, our intellectual and spiritual ideals, risen apace with our conquest of matter, time, and space? Have our youth gained in reverence and in faith, our women in serious purpose and love of family? Are some of us walking in the very footprints of those psychologists who have lost the soul, the mind, and finally consciousness itself? Have we gained the universe and lost the spirit? Shall we ever again be as "wise and true in aim of soul" as were the great comrades of Aeschylus?

Is man now rising to Parnassus?

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